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CONFERENCE IN THE MATTER OF POLLUTION OF INTERSTATE WATERS OF THE MENOMINEE RIVER AND ITS TRIBUTARIES (MICHIGAN-WISCONSIN). VOLUME III. HELD AT MENOMINEE, MICHIGAN ON NOVEMBER 8, 1963

Public Health Service
Washington, D.C.

8 November 1963

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DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Public Health Service

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Conference

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VOL III

In the Matter of:

Pollution of Interstate Waters of the Menominee River
and its tributaries (Michigan-Wisconsin)

Menominee, Michigan
Friday, November 8, 1963

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CONFERENCE

in the matter of

Pollution of the Interstate Waters of the

MENOMINEE RIVER AND ITS TRIBUTARIES

VOLUME III

Menominee, Michigan
November 7-8, 1963

U.S. Department of Health, Education, and Welfare

Washington, D.C.

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Report includes data in [illegible] and discussion on: Urban pollution only; [illegible] the biological water quality; and interstate [illegible] and tributaries; and water pollution objectives and control [illegible]

[illegible] 1963

Conference in the Matter of Pollution of Interstate Waters of the Menominee River and its tributaries (Michigan-Wisconsin) convened at 9:05 a.m., C.S.T., on Friday, November 8, 1963, in Goodfellowship Hall, Menominee, Michigan.

PRESIDING:

Mr. Murray Stein, Chief, Enforcement Branch, Water Supply and Pollution Control, Public Health Service, Department of Health, Education, and Welfare, Washington 25, D. C.

PRESENT:

(As noted in the transcript of November 6, 1963.)

PROCEEDINGS

MR. STEIN: May we reconvene?

We will have Michigan continue. Mr. Oeming?

MR. OEMING: Mr. Chairman, when we left off last night, we left off at, I think, Chapter V of the State's report, and I would like to have Mr. Purdy resume. Mr. Purdy will refer you to the proper section where we left off.

FURTHER STATEMENT OF R. W. PURDY, CHIEF
ENGINEER, MICHIGAN WATER RESOURCES COMMISSION

MR. PURDY: We will start on Enforcement Actions, ·ge 51 of the report.

Instances in which it has been necessary to invoke the enforcement provisions of the Water Resources Act to secure abatement of pollution in the Menominee River Basin are described below:

CITY OF IRON MOUNTAIN

A Notice of Determination was adopted July 25, 1950, setting forth the failure of the city to control pollution of the Menominee River that resulted from discharge therein of untreated sewage of the municipality. A final Order of Determination was adopted November 21, 1950, directing the city to proceed with a financing and construction program to abate pollution on or before June 1, 1954, in accordance with plans approved by the State Commissioner of Health. Upon failure of the city to comply with the order, the Commission at its July 29, 1954, meeting referred the matter to the Attorney General of the State of Michigan for appropriate action. An abatement date of May 1, 1960, was established by Circuit Court decree. The project was completed September 1960. It was a joint treatment facility with the City of Kingsford.

CITY OF KINGSFORD

A Notice of Determination was adopted July 25, 1950, setting forth the failure of the city to control pollution of the Menominee River that resulted from discharge therein of untreated sewage of the municipality. A Final Order of Determination was adopted November 21, 1950, directing the city to proceed with a financing and construction program to abate pollution on or before June 1, 1954, in accordance with plans approved by the State Commissioner of Health. Upon failure of the city to comply with the order, the Commission at its July 29, 1954, meeting referred the matter to the Attorney General of the State of Michigan for appropriate action. An abatement date of May 1, 1960, was established by Circuit Court decree. The project was completed September 1960. It was a joint treatment facility with the City of Iron Mountain.

CITY OF IRON RIVER

A Notice of Determination was adopted July 25, 1950, setting forth the failure of the city to control pollution of the Iron River resulting from discharge therein of untreated sewage of the municipality. A Final Order of Determination was adopted November 21, 1950, directing the city to proceed with a financing and construction program to abate pollution on or before June 1, 1955, in accordance with plans approved by the Michigan Department of Health, such plans to be submitted for approval on or before June 1, 1953. The city reported by letter dated January 11, 1955, its inability to finance the project and admitted to default of the order. The Commission at its meeting on January 20, 1955, referred the matter to the Attorney General for appropriate action. An abatement date of September 1, 1958, was established by Circuit Court decree. The project was completed November 1959.

CITY OF STAMBAUGH

A Notice of Determination was adopted July 25, 1950, setting forth the failure of the city to control pollution of the Iron River resulting from discharge therein of untreated sewage of the municipality. A Final Order of Determination was adopted November 21, 1950, directing the city to proceed with a financing and construction program to abate pollution on or before June 1, 1955, in accordance with plans approved by the Michigan Department of Health, such plans to be submitted for approval on or before June 1, 1953. At the January 20, 1955, meeting of the Commission, Chief Engineer Oeming reported that the city had not yet completed the securing of necessary rights-of-way, which would delay compliance beyond the final abatement date in the order. The Commission referred the matter to the Attorney General for appropriate action. An abatement date of September 1, 1958, was established by Circuit Court decree. The project was completed December 1958.

CITY OF NORWAY

A Notice of Determination was adopted July 25, 1950, setting forth the city's failure to control pollution of Sewer Creek resulting from its discharge therein of untreated sewage. A Final Order of Determination was adopted November 21, 1950, directing the city to abate the pollution on or before June 1, 1954, in accordance with plans submitted to the Michigan Department of Health for approval on or before June 1, 1952. Plans were not submitted in accordance with the time schedule.

On July 31, 1953, a conference was held with the city before the Water Resources Commission to determine the status of the project. Engineering difficulties presented by project and economics of the area were discussed by the city. The city stated that in recent years it was necessary to dewater abandoned mines in the area to keep basements dry and that fresh mine water offered substantial dilution of sewage. No formal action was taken by the Commission.

A staff contact was made March 29, 1954. The city had, at that time, a preliminary engineering report. Authorization for engineers to prepare complete plans and specifications had not been given.

The Commission at its June 23, 1954, meeting moved to summon the city to a show cause conference at the July meeting.

The city's contention that serious pollution did not exist was discussed at the show cause conference on July 29, 1954, following which action was tabled pending a review by staff as to whether conditions had changed since the adoption of the order.

A comprehensive waste survey was conducted by staff on August 18 and 19, 1954. At its December 8, 1954, meeting, the Commission received the report from its staff on the results of its re-investigation. After giving consideration to possible injuries to fish life or lawful occupations as the result of sewage discharges from Norway to Sewer Creek and their effect upon the public health or any conflict with the Michigan-Wisconsin resolution, action was tabled pending receipt of a report by the Michigan Department of Health on the threat to public health.

The Norway situation next came before the Commission at its August 26, 1960, meeting. The Michigan Department of Health reported that a joint review of the situation by staff members of the Department of Health and Water Resources Commission failed to produce evidence of injury to public health sufficient to warrant proceedings to enforce the Commission's order. The Commission directed its Executive Secretary to write the City of Norway that while no action was being taken to enforce the order at this time, it concurred in the recommendation of the Department of Health that the city construct facilities for the treatment of its sewage.

Are there any questions on this particular section?

MR. STEIN: Are there any questions?

(No response.)

MR. STEIN: No questions. Thank you.

MR. PURDY: Assessment of River Conditions.

Investigation and appraisal of the effects of waste discharges on the receiving waters is a continuing program carried on by the staff of the Water Resources Commission. The evaluation parameters commonly used are biological, bacteriological, chemical and physical.

At this time, for the presentation of the Biological Information, I would like to call upon Carlos Fetterolf, aquatic biologist for the Michigan Water Resources Commission.

STATEMENT OF CARLOS M. FETTEROLF, JR., AQUATIC BIOLOGIST, MICHIGAN WATER RESOURCES COMMISSION

MR. FETTEROLF: Mr. Chairman, conferees, ladies and gentlemen:

Before beginning my formal presentation I would like to explain some of the biological terminology and premises I have used in evaluating the situations under investigation.

The effect of an introduced waste on a biological community is evaluated by measuring the deviation of that population from that of a population which the biologist has found, or would expect to find, in a comparable but waste-free environment. A control station above the influence of wastes is often used to establish the expected population structure.

The term tolerance status refers to an animal's general, relative ability to withstand adverse environmental conditions. Thus a tolerant animal is one which can withstand a variety of severe stresses. An intolerant animal is one which cannot withstand these stresses. They are sensitive to water quality changes and exist within a narrow range of habitat requirements. A facultative animal possesses medium tolerance and the ability to exist over a wide range of environmental conditions.

In general, a biological community in a clean-water habitat will consist of small to moderate numbers of individuals of many different species. As stresses are added the more sensitive species are eliminated. The more tolerant forms adapt to the changes and become dominant. Ultimately, conditions can become so severe that even the most tolerant animals cannot survive. With these points established, I will now take up the formal report.

BIOLOGICAL INFORMATION

IRON AND BRULE RIVERS, IRON RIVER, MICHIGAN TO FLORENCE, WISC.

BOTTOM FAUNA

On seven occasions in the past twelve years the Michigan Water Resources Commission staff have investigated biological conditions in the Iron and Brule Rivers, primarily by surveys of bottom fauna populations (See Figure 5).

If I may have the first slide, please? May I go off the record to explain the general makeup of these slides?

MR. STEIN: Surely.

(Discussion off the record.)

MR. FETTEROLF: Results of these bottom fauna studies are depicted in Figure 5, which shows the number of aquatic invertebrate species collected in the sampling points on the seven occasions.

In this report discussion of bottom fauna studies is limited to four key sampling points. One of them is on the Iron River (Station 4) immediately above the Brule confluence, 9.6 miles below the initial source of iron wastes and mine water, and lesser distances from the municipal wastes of Iron River, Stambaugh, Gaastra, and Caspian. The other three study areas are on the Brule River. These are Station 6, 0.7 miles below the Iron confluence at the Scott Lake road bridge; Station 7, 5.7 miles below the confluence at Pentoga; and Station 8, 19 miles below the confluence at the U. S. 2 bridge. Several bottom fauna collections were made at upstream control stations on both the Iron and Brule during the twelve-year period (Stations 1 and 5). Clean-water situations were always found in these areas and were supporting a typical diversified and abundant population of at least 23 species and as many as 74.

The first study in 1951 showed that the bottom fauna at the mouth of the Iron River was restricted in a square foot sample to only two individuals of two species. The bottom fauna of the Brule was nearly eliminated for a few miles below the confluence with the Iron. Square foot samples revealed only four animals of three species at Pentoga and only 17 animals of seven species at the U. S. 2 bridge. This was evidence of a serious pollution problem.

After 1951 several of the mines in the Iron River area constructed settling ponds for their wastes. The next survey, made in 1957, showed improved conditions. In a square foot sample taken at the mouth of the Iron 19 species were represented. These included mostly facultative midges, but some sensitive animals were present. The water was clear and the bottom was only slightly cemented by iron deposits. At Pentoga nineteen species were taken in a square foot sample. Intolerant mayflies, stoneflies, and caddisflies were being supported in moderate numbers.

The drop in species from 31 at the Brule control to 19 at Pentoga was the population's adjustment to the limiting effects of mine wastes and enrichment from upstream municipalities. Despite the increase in midges and the elimination of some of the most sensitive animals the total bottom animal community at Pentoga was acceptable. It was representative of an area with satisfactory water quality. A similar population existed at the U. S. 2 bridge.

A limited survey in 1960 revealed regression of the water quality since 1957. A severely restricted fauna existed at the mouth of the Iron River. Four species were taken in the square foot sample, a reduction from 19 in 1957. At Scott Lake bridge only eight species appeared in the square foot sample, while 14 were found at Pentoga. Most of these animals were midges, although a few caddisflies, mayflies and stoneflies were taken in the Pentoga qualitative collection. These populations on the Brule were unbalanced to the extent that the sensitive macro-invertebrates were present in very small numbers, while the more tolerant midges were abundant.

A spot check at the mouth of the Iron in 1961 revealed no significant improvement. Twenty-eight animals of seven species were taken in a square foot sample from a riffle area. The bottom fauna community was again very restricted and unbalanced.

In 1962 a survey of the Iron and Brule was conducted to determine the effect of acid water pumped from a mine and discharged to the Iron via Sunset Creek. The bottom fauna of the Iron River below Sunset Creek was virtually eliminated. Remnant populations existed at Scott Lake road bridge and Pentoga. Only six species were found by qualitative collecting at Pentoga and their abundance was extremely low. At the U. S. 2 bridge, 14 species were collected, but they represented an extremely unbalanced population of very low abundance. At this time the Brule was very turbid and appeared muddy brown with a slight rust tint. Transparency as measured with a Secchi disk varied between five and eight inches. This turbidity was due to the chemical reaction between the river water and the acid mine water. A grossly polluted condition existed for some 24 miles on the Brule River.

In June of 1963, following corrective measures taken by the M. A. Hanna Company to stop the pumpage of acid mine water to the Iron River, the streams were checked for the presence of bottom fauna. At the mouth of the Iron only four species were found. However, more animals had become established at the upper stations below Sunset Creek. It is probable that a variety of organisms had not had an opportunity to reestablish their populations either by drift or reproduction. Recolonization was progressing more rapidly on the Brule. At Pentoga, 22 species were found, including baetid mayflies and fingernail clams.

As a further check on recolonization, qualitative samples of the bottom fauna were made in mid-September 1963. This investigation revealed the existence of a more diversified and abundant population than had been noted in any previous survey. On the Iron River, just above its confluence with the Brule, 19 species were collected. Although midges were dominant, some sensitive forms were present in small numbers. At Scott Lake road bridge on the Michigan side of the Brule River 3/4 mile below the confluence, 36 species of macro-invertebrates were found. Among the more sensitive animals collected were six species of caddisflies, six of mayflies, and two of stoneflies. Filamentous algae (Cladophora and Oedogonium)and a slime were growing luxuriantly in response to the nutrients supplied by the treated sewage from Iron River, Stambaugh, Gaastra, and Caspian. Suspended solids were strained from the river and trapped by these growths, resulting in a rapid clearing of the water and a sludgy bottom deposit. This type of substrate was not suitable for the maintenance of large numbers of the many species found.

At Pentoga on the Brule, 44 species of macro-invertebrates were collected. Among the sensitive animals in the population were eight species of caddisflies, six species of mayflies and four of stoneflies. The luxuriant algae growth had diminished, but the slime was still common on bottom materials. Water color was smoky green. Bottom animals were present in near normal abundance and species distribution. Hydropsychid caddisflies and baetid mayflies were common. Midge larvae were the most abundant animal. This community and those sampled downstream indicated that satisfactory water quality conditions had existed in the Brule River during the summer of 1963.

CONCLUSIONS

In 1951 the bottom fauna of the Iron River was virtually non-existent due to mining wastes. The limiting effect of this pollution on the bottom dwelling animals was evident for at least 19 miles on the Brule River below the Iron River. A similar survey in 1957 showed partial recovery of the bottom fauna in the lower Iron. Satisfactory water quality conditions in the Brule at Pentoga and downstream were indicated by the bottom animal populations sampled.

Throughout 1960 and 1961 the bottom fauna community was again severely depressed in the lower Iron. In the Brule at Pentoga the population was restricted in abundance and variety, which reflected a moderately polluted condition.

In 1962 the Brule River was grossly polluted for at least 24 miles by acid mine water pumped to Sunset Creek, a tributary to Iron River. Bottom dwelling macro-invertebrates were reduced to remnant populations. The abundance of animals was extremely low.

Recolonization of the river occurred throughout the spring and summer of 1963. The populations of bottom animals were higher and more diversified in September 1963 than during any previous survey. However, restriction of the abundance of bottom fauna was observed in the Brule River at the Scott Lake bridge area, where deposition of suspended solids, algae growths and slimes create an unfavorable stream bottom habitat. Recovery to a population representative of an area with satisfactory water quality was apparent at Pentoga and other stations downstream.

FISH

The Institute for Fisheries Research of the Michigan Department of Conservation has investigated the fish populations of the Iron and Brule Rivers annually since 1961 (See Figures 6 and 7). The 1962 and 1963 surveys were conducted in cooperation with the Michigan Water Resources Commission. Collections of the fish were made with a D. C. shocker at the same stations for known periods of time. Use of this method has not provided a precise measure of fish abundance over the three years due to variables such as conductivity, turbidity, cloud cover, volume of flow, depth of water, etc., which affect the efficiency of this collecting tool. However, the positive information gathered provides an approximation of the composition and size of the fish population before, during, and after the gross pollution which occurred in 1962, as shown in Figure 6, which graphs the number of fish caught per hour.

In the Iron River control station the catch per hour ranged from 174 fish in 1961 to 429 in 1963. This illustrates the variability of results exclusive of any environmental changes due to introduced wastes. Trout, blacknose dace, longnose dace, and sculpins, species commonly associated with clean, cold water, were collected. Trout are stocked at this location.

In 1961, 121 fish per hour were captured in the Iron at Station 4 immediately above the confluence with the Brule. This is downstream from all mining and municipal wastes. Species commonly taken were white suckers, creek chubs, lake chubs, and common shiners. Trout, not stocked in this stretch of the stream, were present but uncommon. In 1962 no fish were collected at three stations on the Iron River between Sunset Creek, which was the upstream source of mine water, and the river mouth. Apparently the entire fish population was eliminated. Three species of fish held in a livebox in the Iron River five miles below Sunset Creek in December 1962 were killed in less than 38 hours.

Following corrective action to control the principal source of mine water, the fish population was reestablished in less than eight months. The average capture rate for the three stations in the Iron below Sunset Creek was 256 fish per hour in 1963.

At the Brule River control station the catch of fish per hour was consistently high, ranging from 243 to 393. The capture rate for trout varied from 27 per hour in 1961 to two per hour in 1963, although trout are not stocked within six river miles of this location.

In the Brule River, downstream from the Iron confluence, fish were collected at five sampling locations from 3/4 mile to 22 miles below the junction. At these stations in 1961 the hourly rate of fish captured was fairly constant, ranging between 178 and 331. In 1962 the average rate of capture was 67 fish per hour at five stations, significantly lower than in 1961. It was concluded that this reflected a reduced population rather than a lowering of collecting efficiency.

In the 1963 survey the hourly fish capture rate in the Brule below the Iron confluence was higher than in 1961 or 1962, reflecting the improved water quality. A peak capture rate of 773 fish per hour was reached at the Pentoga station, six miles below the confluence. The fish appeared to be in excellent condition at all stations on the Brule River.

Mr. Thomas M. Stauffer, Fisheries Biologist with the Michigan Institute for Fisheries Research, was in charge of the fish shocking crew in 1962 and 1963. In a written summary of his investigations he stated:

> "... in the Brule River below the Iron River . . ., based on past experience in stream collecting, I judge that fish were present in at least near normal abundance in 1963."

Figure 7 graphs the number of fish of various species captured per hour by D. C. shockers.

At the Scott lake road bridge, 3/4 of a mile below the Iron confluence, the waters of the Brule and Iron are not thoroughly mixed. In 1962 only two fish per hour were taken on the Michigan side while 92 per hour were captured on the Wisconsin side. In 1963, 489 fish per hour were taken on the Wisconsin side while 270 per hour were captured on the Michigan side. Trout were present although they are not stocked within 7 stream miles of this station. Their hourly capture rate was six on the Wisconsin side and 20 on the Michigan side. Trout were not commonly found in the Brule below this station during any of the investigations. They are not stocked downstream from the Iron River by the Michigan Department of Conservation.

In June 1963 newly-hatched minnows were common along the shoreline in the lower Iron and in the Brule River at Pentoga and the U. S. 2 bridge. White suckers, creek chubs, and blacknose dace less than two inches long were common in September 1963 in the lower Iron River. These small fish were believed to be young-of-the-year. In the Brule at Scott Lake, Pentoga, and downstream stations small yellow perch, white suckers, longnose suckers, creek chubs, blacknose dace, and common shiners less than two inches long were commonly collected.

CONCLUSIONS

Collection of fish by D. C. shocker in 1961 established the existence of a resident fish population in the Iron and Brule Rivers from Iron River, Michigan, to Florence, Wisconsin.

Following the pumpage of acid mine water to the Iron River via Sunset Creek in 1962 a resurvey of the streams was made. No fish were captured at three stations on the Iron River from the junction of Sunset Creek to the Brule confluence. This indicated virtual elimination of the fish population from this area. At five stations located in a 22-mile area of the Brule River below the Iron confluence the average rate of capture was 67 fish per hour in 1962. This showed that the fish population, although much lower than during the 1961 survey, was far from eliminated.

In the 1963 survey the capture rate for fish was higher at almost all stations on the Iron and Brule than it had been in 1961 during the initial survey. This indicated a sharp increase in the Brule River fish population and a re-establishment of the Iron River fish population. It was concluded that the Brule River below the Iron confluence supported fish in at least near normal abundance in 1963.

Successful reproduction was suggested by the presence of newly-hatched minnow fry in June 1963 in the lower Iron and in the Brule below the Iron confluence.

Fish less than two inches long of many species were captured at several stations in the Iron and Brule Rivers in 1963. It was concluded that many of these fish were young-of-the-year.

MENOMINEE RIVER, VICINITY OF IRON MOUNTAIN AND KINGSFORD, MICHIGAN

Three surveys of the bottom animal communities of the Menominee River in the Iron Mountain-Kingsford, Michigan, area have been conducted in the past seven years (See Figures 8 and 9). Figure 8 charts the number of species and the tolerance status of the bottom dwelling macro-invertebrate fauna.

In 1957 bottom samples were collected from both sides of the river at the M-95 bridge as part of a biological reconnaissance survey of the river system. The single sample collected 50 yards below the junction of the river and the ditch carrying the untreated municipal and industrial wastes from Iron Mountain-Kingsford revealed a very heavy sludge deposit containing large amounts of charcoal. As would be expected, worms and midges tolerant of organic wastes were dominant.

In the summer of 1960, samples of the bottom and its fauna were collected from thirteen stations in the river area from above the newly operative Iron Mountain-Kingsford sewage treatment plant to the Big Quinnesec Dam, 2.4 miles mstream. Wastes from the Kingsford Chemical Company, a coal manufacturer, which has now ceased operations, red the river via the ditch immediately upstream from the -95 bridge.

Bottom animals in the three control stations sampled in 1957 and 1960 were typical of a clean-water, large-river environment.

Six samples were secured from the Michigan side of the river from the M-95 bridge to the upper part of the Big Quinnesec pool one mile downstream. These samples, augmented by observations, showed sludge, silt, charcoal fines, and organic debris along the shoreline in a band which extended into the river some 40 to 50 feet. In this band of sludge, tolerant animals such as sludgeworms and certain of the midges were abundant, while other tolerant species of the leeches and sowbugs were common. Environmental conditions did not become severe enough to exclude a variety of facultative midges or the Campeloma snail whose habitat preference is the muck that collects along river banks in quiet-water areas. Two stations (5 and 7) were located about 50 feet away from the bank. At these locations more facultative and intolerant species were found than at the stations closer to the bank. The composition of the bottom fauna population at these stations was similar to that found at two locations across the river. These findings indicate that the response to the wastes in this region of the river was mainly limited to the 50-foot band along the Michigan side. The width of the river at this point is approximately 250 feet.

Net-building hydropsychid caddisflies, one of the more sensitive facultative forms, were virtually eliminated from the river below the sewage treatment plant and charcoal discharge. It is possible that suspended solids could clog food-screening nets built by this insect larvae.

In 1960 three bottom samples collected from different parts of the Big Quinnesec pool in 26 to 45 feet of water showed a mud bottom with varying amounts of organic debris, charcoal fines, oil traces, and sewage odor depending on the proximity of the station to the head of the reservoir where the river current slackened and suspended solids settled out. As is normal for this bottom type, tolerant sludgeworms and the *Procladius* midge larvae which feed on them were found at each sampling location. However, the presence of facultative midges, scuds, and snails, plus intolerant burrowing mayflies indicated that environmental conditions were normally satisfactory. A vertical series of water samples taken in the middle of the Big Quinnesec pool at 5 p.m. July 29, 1960, and analyzed for dissolved oxygen content support this statement.

Results were as follows:

Surface - 6.8 mg/l
10 feet - 6.8 mg/l
20 feet - 6.6 mg/l
30 feet - 7.0 mg/l
40 feet - - 7.0 mg/l
45 feet - 7.2 mg/l

These data suggest that typical lake stratification did not exist and that a density current was present.

In 1961, five bottom samples were collected from the river and impoundment below the sewage treatment plant as a spot check on any changes which might have occurred in the bottom fauna during the past year. Besides having had the sewage treatment plant in operation a year longer, the charcoal manufacturer had ceased operations. Despite this lessening of the waste load, an aesthetic betterment of the

Michigan shoreline, and obvious reduction of the sludge and charcoal beds, no significant improvement in the bottom fauna population was noted.

CONCLUSIONS

From these studies it was established that treated sewage from the Iron Mountain-Kingsford area and past discharges from the Kingsford Chemical Company resulted in the deposition of sludge, silt, charcoal fines, and organic debris in a 40 to 50 foot band along the Michigan bank of the Menominee River for about one mile below the entry of the wastes to the river. The unbalanced bottom fauna community found in the locally affected area was typical of the biological response expected in sludge and silt deposits downstream from the introduction of organic wastes, which are a source of food for certain aquatic invertebrates. By the limits of the area affected and the moderate bottom fauna degradation evident, it was concluded that a polluted condition significantly damaging to the total bottom fauna community of the receiving stream did not exist.

MENOMINEE RIVER, VICINITY OF MENOMINEE, MICHIGAN AND MARINETTE, WISCONSIN

Five investigations into aspects of aquatic biology of the Menominee River near its mouth have been undertaken in the past 12 years. Results of two surveys are graphed in Figures 10 and 11. Figure 10 charts the number of species and the tolerance status of the bottom dwelling macro-invertebrates collected in the two surveys.

In 1951 three bottom samples were taken during a reconnaissance survey of the river system. A normal bottom animal population typical of a clean-water environment existed at the control station above the Scott Paper Company upper dam. In mid-river, just above the Marathon Paper Company, but below all other waste discharges, the bottom mud was soft and contained a large quantity of debris and wood chips. This bottom supported over 3,500 of the very tolerant sludge-worms per square foot, indicative of an abundance of organic materials available for food. In addition, six facultative and one other tolerant species were taken in the same sample which showed that environmental conditions were adequate to support a reasonable variety of aquatic life. At the river mouth, below the Marathon Paper Company outfall, the bottom fauna population in a single sample dropped to 20 individuals of three species, a very restricted community which apparently reflected an adverse effect due to wastes from the board mill.

In 1957 five bottom samples were collected from the lower river and five from Green Bay off the river mouth.

The bottom animal community at the control station, located immediately below the Scott Paper Company upper dam, was again representative of a typical clean-water environment. A comparable sample collected below the Scott Paper Company lower dam, downstream from the sulphite mill and the groundwood mill, contained only one of the eleven intolerant species found at the control. Some of the less tolerant facultative forms had also been eliminated. However, the total population was predominantly of facultative animals. A similar situation existed below the U. S. 41 bridge above the start of the small boat channel. The slime which grew profusely on rocks in the moving water below the lower dam and which characteristically broke loose to float downstream was tangled with wood fibers on the river bottom at these two stations. These slime growths thrive on the nutrients supplied by wastes associated with paper manufacturing and have been reported in the literature as harmful to the survival of walleye eggs and the production of bottom-dwelling invertebrates.

A sample taken just above the Marathon Paper Company outfall in 1957 showed a mucky bottom containing considerable wood processing wastes, decaying slime growths, and organic debris. As in 1951 a relatively diverse fauna of eight species, including four facultative species, was found in the single sample taken.

Below Marathon in the river channel between the breakwaters a similar bottom type of debris, muck, fiber, and decaying slime growths existed in 1957. Apparently an improvement over the 1951 environmental conditions had occurred because a large, diverse population of nine species, including three facultative and one intolerant form, was present.

Off the river mouth in Green Bay the bottom was coarse to medium sand. A thin layer of mud and traces of fiber occurred at the stations to the north of the breakwater. The response of the tolerant burrowing sludgeworms as well as the facultative midges and intolerant mayflies was evidence of enrichment by an abundant food supply without degradation of the environment.

In late September 1963 a reconnaissance survey of the river was carried out downstream from the lower dam of Scott Paper Company. General collections made in the shallow rapids downstream from the lower Scott mill revealed a diverse bottom fauna community. However, only tolerant and facultative forms were numerous while intolerant animals were uncommon. An unbalanced and restricted population existed here.

Ten Petersen dredge hauls were made from the head of the island below the U.S. 41 bridge to the mid-breakwater area. Very sparse populations of tolerant red midges and sludgeworms were screened from the muck, sludge, fiber, and decaying slime which covered the main river bottom. Populations were less diverse and animals less abundant than in 1957.

Two investigations of fish off-flavor have been conducted. In May 1960 a panel of two persons concluded that five of eight walleyes caught from the river had an off-flavor that left a "fuel oil-kerosene" taste in the mouth. In August 1961 a panel of seven persons judged that of six walleyes from the river, one was "good," two were "fairly good," one was "just acceptable," and two were "not acceptable." It was learned by personal interviews with many fishermen on the river that all do not recognize the existence of an off-flavor problem, although most have heard others mention it. Heavy fishing pressure exists and good walleye fishing is available to the tourist and local fishermen from spring through fall. A cooperative investigation of this problem with Michigan State University and the Michigan Department of Conservation was scheduled for this past October, but has been postponed.

CONCLUSIONS

Based on the full-scale survey in 1957 and the reconnaissance survey of September 1963 by the Michigan Water Resources Commission it appears that degradation of the bottom-dwelling biological community has taken place between 1957 and 1963 in the lower Menominee River. Facultative animals commonly found in the 1957 survey were not taken in the 1963 survey from the head of the island below the U.S. 41 bridge to the mid-breakwater area. The absence of these animals may be attributed to a change in one or a combination of several factors which cannot be specifically identified by the data at hand. Bottom fauna of the lower Menominee presently exist in sparse populations of very tolerant animals.

Despite the degradation of the bottom fauna the sport fishery for walleyes remains good in the lower river. It appears that walleyes actually seek out this area, since they are not abundant in the adjacent bay itself as indicated by their unimportance in the commercial fishery.

Attempts to evaluate the elusive problem of fish off-flavor and to identify the source have not been successful. Further work is planned for the spring of 1964.

A Michigan conservation officer stationed in Menominee requested local fishermen to advise him of any off-flavor in the walleyes, caught during 1963.

No complaints to this effect have been received by him, nor have any complaints been registered with the District Engineer of the Michigan Water Resources Commission in the past year.

Are there any questions?

MR. STEIN: Do you have any questions?

MR. OEMING: Yes, I do, Mr. Chairman. I have two questions.

I believe the other day the question arose as to where the fish were caught which were used in the tests that had been run, and I wonder if Mr. Fetterolf can tell us where these fish were caught, the walleyes? They were subjected to tests in 1960 and 1961.

MR. FETTEROLF: Yes, sir. In 1960, the fish were provided by Mr. John Wormwood. He secured these fish from local sports fishermen in a cooperative move. They were fresh fish.

MR. STEIN: Just for the sake of the record, would you identify the man you spoke of?

MR. FETTEROLF: John Wormwood, the Michigan Conservation Department officer stationed at Menominee, Michigan.

In 1960, the fish were caught off the Hattie Street bridge, which is one of the upstream bridges of the Menominee River, but below all the paper mill wastes, except Marathon.

In 1961, the fish were collected by the use of gill nets off the sugar beet plant, which is below the Scott Paper Mills, but again above Marathon.

At this time we also secured fish from sports fishermen who were fishing from the railroad trestle above the Interstate 41 bridge.

MR. OEMING: I have one more question, Mr. Fetterolf.

During your contacts and studies of the river, did you ever make any observations of the fishing pressures in the area of Niagara, Wisconsin?

MR. FETTEROLF: Yes. The Michigan Water Resources Commission spot-checks at various locations on the Menominee River, and in 1957, I collected bottom samples from the U. S. 8 bridge below Niagara and below the Kimberly-Clark mill.

These samples contained a great deal of wood chips, bark and fiber. An extensive wood chip bed was present at that time. I did not see anyone fishing there.

In 1961, I returned to the same location, and I again sampled the bottom, and I found that these bark and chip deposits which had been present were no longer there. There were three fisherman on the river at this location, and between them they had caught twenty large bluegills.

MR. OEMING: How large, when you say "large"?

MR. FETTEROLF: As bluegills go, very large. They were over a half a pound apiece. They had also caught bullheads.

I opened up the stomachs of the bluegills, and found them feeding on the tolerant sowbugs, which were present in the area.

MR. OEMING: That is all I have, Mr. Chairman.

MR. STEIN: Are there any questions from the Wisconsin conferees?

(No response.)

MR. STEIN: Mr. Schneider?

MR. SCHNEIDER: I have a couple of questions.

I wonder if I could go back to a previous portion of the report. It wasn't a part of your report, Mr. Fetterolf, but maybe you can answer the question anyway.

On Page 29 of the report it says:

"The Brule River in Michigan is a trout stream as indicated by creel census."

MR. FETTEROLF: I am having difficulty hearing you, sir.

MR. SCHNEIDER: It says in this report:

> "The Brule River in Michigan is a trout stream as indicated by creel census."

It goes on to report the number of fish that were reported, and it measures this up through 1962.

I was wondering, does this include a count before or after the pollution that occurred because of the acid mine drainage?

MR. FETTEROLF: The creel census results which are presented in this section on sport fishing on the river were compiled from conservation officer reports, which are routinely collected by the Michigan Department of Conservation.

Mr. William Marks of the Water Resources Commission compiled this specific information. However, I am familiar with it.

I don't believe that the 1963 results were available to him.

Now, the Brule River in Michigan is only stocked at two locations. Both of these are upstream from the confluence with the Iron River. The nearest stocking point to the confluence of the Iron River is seven stream miles.

The reports of the conservation officer from Michigan -- the creel census reports -- do not give the precise location at which they were made.

However, we believe that almost all of these reports come from the upstream areas which are stocked, and which receive the heavy fishing. I don't believe many of them come from the area below the Iron confluence.

MR. SCHNEIDER: I am just curious -- you show in your own findings here that there was a reduction in the number of fish after this mine discharge, and I was wondering, were there any fish kills reported?

MR. FETTEROLF: No, sir.

MR. SCHNEIDER: I have another question or two here, if I can find my notes.

On Page 60 of your report --

MR. FETTEROLF: 64?

MR. SCHNEIDER: Page 60, in the second paragraph from the top, you mention that:

> "The luxuriant algae growth had diminished, but the slime was still common on bottom materials."

Then you go down further at the end of the paragraph and you say:

> "This community and those sampled downstream indicated that satisfactory water quality conditions

"had existed in the Brule River during the summer of 1963."

I was wondering if slime was considered satisfactory or as indicative of satisfactory water quality?

MR. FETTEROLF: The slime appears on the bottom of the stream. I hesitate to call it "slime." I believe it might be an iron bacteria slime. It does not seem to be the usual slime that biologists run into.

The slime growths found below paper mills characteristically slough off and create quite a nuisance downstream and degrade the bottoms by interfering with many of the insect larvae.

These slimes are of a slightly different origin. They are caused by the iron wastes and the municipal waste discharges, but the bottom animal community in existence at this point where the bottom is degraded -- the bottom itself is degraded -- is characteristic of an area with clean water flowing over it.

We have 44 species of macro-invertebrates at this station. They are present in near-normal abundance and species distribution.

Among the sensitive intolerant animals collected at this station were 8 species of caddisflies, 6 of mayflies, and 4 of stoneflies. These are animals indicative of clean water.

MR. SCHNEIDER: That answers my question.

Down further on that same page, in your conclusions, in the second to last paragraph, you stated:

> "In the Brule at Pentoga the population was restricted in abundance and variety, which reflected a moderately polluted condition."

Then, in the sentence right below it, you talk about "grossly polluted."

Do you have any parameters between moderate and gross pollution?

MR. FETTEROLF: Yes, sir, but they are not measurable parameters. They are based on experience.

MR. SCHNEIDER: I think that is all the questions I have.

MR. WISNIEWSKI: Mr. Chairman.

MR. STEIN: Yes, Mr. Wisniewski.

MR. WISNIEWSKI: I have a point, I think, that should be cleared up here.

Mr. Schneider asked the question, was there any fish kill reported, which seems to indicate that there might have been some fish kill reported.

Was there any fish kill in the Brule River as the result of the discharge of mine wastes?

MR. FETTEROLF: Oh, no, not that we are aware of -- not that we know of.

MR. WISNIEWSKI: Our Conservation Department checks that area quite closely, and if there had been a fish kill, it would have been called to our attention.

MR. SCHNEIDER: There was one other question that I had on Page 65. It is in about the middle of the page at the bottom of the third paragraph.

Were there any measurements made on the Wisconsin side? In that last sentence there you stated that:

> "These findings indicate that the response to the wastes in this region of the river was mainly limited to the 50 foot band along the Michigan side. The width of the river at this point is approximately 250 feet."

You restricted your investigation just to the Michigan side at this point?

MR. FETTEROLF: No, sir. We are right in the same area that you are selecting this wordage from.

I am trying to establish the point that when I moved away from the Michigan bank a distance of 50 feet, the bottom fauna population existing at that point was similar to that existing on the Wisconsin side across the river.

This indicated to me that the effect on the bottom of the river from the waste discharges of Iron Mountain and Kingsford was limited to a 50-foot band along the Michigan side.

MR. SCHNEIDER: Thank you. I have no further questions.

MR. STEIN: I don't want to prolong this. There were just two answers I did not understand, and I know this isn't new.

For the life of me, I can't understand parameters. Most of the times they seem to have numbers, and now they just mean what they are in your professional judgment.

As a matter of fact, I am not deprecating that in the least. If, in your professional judgment, you believe that something is moderately polluted or grossly polluted, this is something we have all the time.

My notion of what parameters were were some kind of numbers that were used which really didn't have the force and effect of regulation, objective or anything. They are just used around.

The next point that I didn't quite get, I think the question Mr. Schneider asked, if I understood it, was did you in fact make any investigation on the Wisconsin side of the river?

MR. FETTEROLF: Yes, sir. I collected samples.

MR. STEIN: In Wisconsin?

MR. FETTEROLF: In Wisconsin.

MR. STEIN: Right. Thank you.

Are there any further questions?

(No response.)

MR. STEIN: If not, will you go ahead, Mr. Oeming?

MR. OEMING: No questions.

MR. PIERCE: No questions.

MR. RONK: No questions.

MR. STEIN: Does this conclude Mr. Fetterolf's statement?

MR. OEMING: Yes, that is all of Mr. Fetterolf's statement.

MR. STEIN: Thank you.

MR. OEMING: Mr. Chairman, there is one question, I think, that remains unresolved, in your mind at least, and I think you were asking me if Mr. Purdy was the proper man to answer the question about the cementing problem.

Do you wish to continue that?

MR. STEIN: No. I thought that in the interests of saving time we could save that for the final discussion. I didn't overlook it.

MR. OEMING: I see.

MR. STEIN: As to what you wanted to do about that cementing problem.

As I see it, if the cementing problem exists, the solution or the remedial solution to that may be a public works solution, where you may want us, after appropriate study with you or recommendations, possibly to make a recommendation to the Corps of Engineers or the Congress for appropriate work to get rid of this cementing if it exists.

If it does not exist and you don't want that, then we can take it up later. However, I think the point of view that you had is clear, and I think we would be guided by your judgment on what you wanted to do about that portion of the river.

MR. OEMING: I see. Thank you.

MR. PURDY: May I proceed, Mr. Chairman?

MR. STEIN: Yes.

FURTHER STATEMENT OF R. W. PURDY, CHIEF ENGINEER, MICHIGAN WATER RESOURCES COMMISSION

MR. PURDY: Bacteriological, Chemical and Physical Information.

The investigative work and results obtained are presented in Appendix D and are summarized as follows:

R. W. Purdy

IRON RIVER

The effects of present iron mine drainage are reflected in a moderate increase in ferric iron below the Iron River area. The concentrations of this iron (4.2 mg/1 maximum observed value) have not proved to be detrimental to water quality for the uses made of this stream. No ferrous iron was found in the river samples below the iron mine discharges. Color and turbidity of the Iron River (15 mg/1 and 20 mg/1 respectively) are not considered excessive and create no ascertainable injury. Sampling indicated an increase in coliform bacteria below the Iron River area reflecting the effects of the sewage effluent discharges of Iron River, Stambaugh, Caspian and Gaastra. Maximum B.O.D. observed below Iron River was under 3 mg/1; dissolved oxygen was near saturation at all stations.

BRULE RIVER

Sampling of the Brule River above and below the confluence with the Iron River indicates slight increases in turbidity and ferric iron (10 and 0.8 mg/1 respectively) in the station below the confluence. No ferrous iron was observed in Brule River samples. There was an increase in coliform bacteria below the Iron River (91 MPN/100 ml to 24,000 MPN/100 ml).

PAINT RIVER

Sampling of the Paint River above and below the City of Crystal Falls indicates a slight increase in coliform bacteria immediately below the point of sewage discharge. One-half mile below Little Bull Dam, approximately 5 miles above the confluence of the Paint River with the Brule, the effect of the waste discharge was not ascertainable. There was no reduction in the dissolved oxygen content of the Paint River.

MENOMINEE RIVER

Iron Mountain-Kingsford

Sampling above and below the discharges from the Iron Mountain-Kingsford area show no effect on water quality of the Menominee River from this source. There was no measurable change detected in color, turbidity, dissolved oxygen, biochemical oxygen demand or coliform bacteria.

Norway

Sampling for coliform bacteria above and below Sewer Creek indicates a slight increase in coliform bacteria below Sewer Creek reflecting the effects of Norway discharges. At severe drought flows a dilution factor in excess of 100 to one is available for Sewer Creek in the Menominee River. The effect of Norway discharges on the Menominee River is not presently concluded to be significant in view of the upstream bacterial quality of the river and the uses made of the stream in the area.

Menominee Area

Sampling of the Menominee River in the Menominee area showed maximum B.O.D. values of 4.6 mg/1 in the left one-third of the channel and 4.4 mg/1 in the right one-third of the channel. Both maximum values were observed at the Sheridan Road bridge in Menominee. This station is below both municipal sewage treatment plants and the two Scott Paper Company mills. These organic loadings in addition to that discharged by the American Can Company, Marathon Division, do not critically affect dissolved oxygen levels in the Menominee River as shown by the sampling surveys. The minimum dissolved oxygen concentration observed was 4.8 mg/1 near the mouth of the river. Sampling on the Michigan side of the river showed an increase in coliform bacteria below the Menominee municipal sewage treatment plant. However, the observed concentrations of these organisms are not viewed as being of public health significance.

LITTLE CEDAR RIVER

Sampling of the Little Cedar River was performed to assess the effects of discharges from the Village of Stephenson and the White House Milk Company on the interstate waters of the Menominee River. The samples show water of excellent quality.

Are there any questions?

MR. STEIN: Are there any questions or comments?

MR. OEMING: No.

MR. STEIN: Thank you very much, Mr. Purdy.

Mr. Oeming, do you want to continue?

STATEMENT OF L. F. OEMING, EXECUTIVE SECRETARY, MICHIGAN WATER RESOURCES COMMISSION

MR. OEMING: Mr. Chairman, conferees:

The success of the Water Resources Commission and Health Department staff efforts, combined with those of the Water Resources Commission member agencies, in curbing pollution in the Michigan portion of the Menominee River Basin, is outlined by the foregoing chapters of this report. The exercise of procedures authorized by statute has been demonstrated. The Health Commissioner may, and does, withhold construction permits for new public sewer systems or extensions to existing systems where adequate provision has not been made for treatment. He has exercised due care to see that sewerage systems are properly planned, constructed and operated so as to prevent unlawful pollution of the streams, lakes and other water resources of the State. He has classified the sewage treatment plants and required that the operator in responsible charge of each plant be certified as to competency for operation of plants of that class, and he requires each community operating a sewerage system to submit such records as he may consider necessary to show adequacy of performance.

Conferences to show cause why pollution should not be abated have been held before the Water Resources Commission. New or increased pollution has been prevented by Orders of Determination and existing pollution has been abated by Final Orders of Determination, both issued by the Water Resources Commission pursuant to its statutory authority. Orders and Agreements of the State Health Commissioner have been equally effective in accomplishing these ends. When compliance was not forthcoming by the administrative tools at hand, the Water Resources Commission and Health Commissioner have sought and have obtained enforcement in the courts through referral of the defaulted Order, or Agreement, to the Attorney General.

MR. STEIN: May I have a point of information there?

MR. OEMING: Yes, sir.

MR. STEIN: I meant to ask this yesterday and didn't.

Is your Attorney General required to bring action when you refer a case to him, or may he exercise his discretion?

MR. OEMING: It is discretionary, but he has never failed us yet.

MR. STEIN: Thank you.

MR. OEMING: There are no municipal or industrial waste treatment needs outstanding where actionable violations of the Michigan pollution control statutes have been officially identified by either agency that have not been completed or programed.

The dynamic nature of a mobile population and industry continually changes the relationship between pollution loadings on the stream, resultant water quality and water management objectives. Changes in raw waste quality can make obsolete today's adequate treatment facilities. That these changing conditions have been recognized and are being met without undue delay is evident by the action taken by the Water Resources Commission with respect to recent pollution of the Iron and Brule Rivers by acid mine waste from Hanna Mining Company at Iron River and the Health Commissioner's request for chlorination of sewage effluent at Alpha, Caspian and Gaastra; the sewer interceptor project at Iron River; the major additions in sewage treatment at Stephenson and minor changes at Mineral Hills.

Investigation and appraisal of pollutional discharges from all sources has been and will remain a continuing process by the combined efforts of the Water Resources Commission and the Health Department staffs.

What is satisfactory today, in relation to water quality objectives and uses of receiving waters, may be inadequate or unsatisfactory tomorrow. The staffs of the two agencies continually appraise the magnitude and quality of pollution discharges, both present and impending. Their present effect upon resources and uses of the receiving waters is examined and evaluated. When additional controls are found to be necessary to meet the requisites of Michigan statutes, such facilities will be required.

Since 1954, the Water Resources Commission program of pollution abatement in the Michigan portion of the Menominee and Brule Rivers and their tributaries has been consistent with the following joint resolution of the Wisconsin Committee on Water Pollution and the Michigan Water Resources Commission:

> "WHEREAS, the MONTREAL RIVER, the BRULE RIVER, and the MENOMINEE RIVER are interstate streams common to the States of Michigan and Wisconsin and pollution thereof, and of their tributaries, originating in one state does or may adversely affect public health or public rights in both states, thus creating a problem of common interest requiring correction by said states; and

L. F. Oeming

"WHEREAS, protection of public health and preservation of public rights require that pollution of said waters by sewage and industrial wastes injurious to public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational or other pursuits, or to wildlife, fish or aquatic life be abated or prevented; now therefore

"BE IT RESOLVED, that the Michigan Water Resources Commission and the Wisconsin Committee on Water Pollution each does hereby agree to require the effective abatement of existing pollution and prevention of additional pollution of said streams and tributaries from sources within the boundaries of its state as provided by the laws of such state to the end that said waters may be maintained or rendered suitable for the purposes heretofore defined and that in furtherance of these objectives, the guiding policy shall be that facilities for treatment of sewage shall provide at least effective sedimentation and disinfection with such secondary or higher degree of treatment as conditions may require and that facilities for treatment or "control of industrial wastes shall provide the degree of protection against pollution warranted in each case; and

"BE IT FURTHER RESOLVED that adoption of this resolution by the water pollution control agency of each state shall be evidenced by the signature of its executive officer."

Attached joint resolution was adopted in behalf of the Water Resources Commission of Michigan and the Wisconsin Committee on Water Pollution on July 30, 1954, at Houghton, Michigan."

The staffs of the Water Resources Commission and the Michigan Department of Health take the position that adequate control measures have been either completed or programed for completion to prevent waste discharges originating from Michigan sources from endangering the health or welfare of persons in Michigan or Wisconsin and there have been no undue delays, in effectuating the control measures.

Minor changes in the physical, chemical or biological content of the receiving waters naturally result from the introduction of controlled wastes. However, the staffs of these two State agencies categorically reject the identification of whatever detectable local conditions are produced by such wastes as being "degraded" or "pollutional." We respectfully remind the conferees that it is not consistent with the law's basic concept of reasonableness to require waste treatment beyond the point of sensible benefit to public or private interests.

That concludes our statement, Mr. Chairman, except for the appendices, which we wish to have made a part of the record.

MR. STEIN: Without objection, that will be done.

(The appendices referred to are as follows:)

APPENDIX A

MONTHLY OPERATION REPORT

Report of operation of the water treatment plant at Menominee

WATER TREATMENT PLANT

for the month of September 196[illegible]

Menominee, Michigan

October [illegible] 196[illegible]

Chlorine—Pounds on hand: October

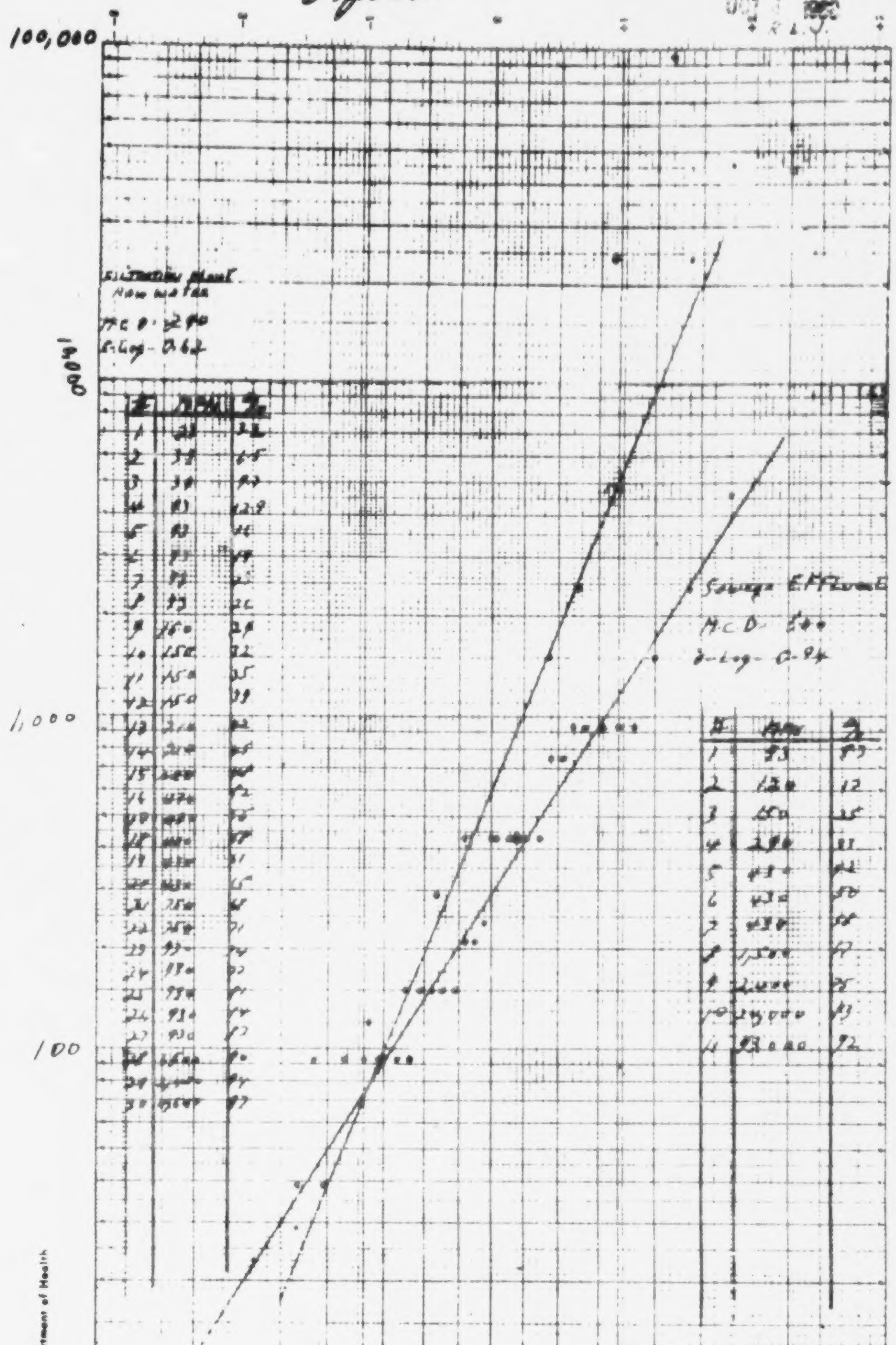
Address of residual chlorine sampling station on distribution system: Sewage Plant

Menominee

By: C. [illegible] Supt.

September - 1963

OCT 1963



D-4-a
Michigan Department of Health

Menominee, Michigan

O.F. Skipping

APPENDIX B

D-4
MICHIGAN DEPARTMENT OF HEALTH

OPERATION REPORT of SEWAGE TREATMENT PLANT FOR

Iron Mountain-Kingsford MICHIGAN

OCT 10 1963
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MONTH September 1963

MISCELLANEOUS DATA

OPERATOR A. C. [illegible]

Date	Weather			Type*	Raw Sewage			Grit	Plant Eff E. Coli	Cl₂	Power	AUX. FUEL	Remarks
	Precip	Temp. (°F)			Temp	Flow							
	Inches	Max.	Min.		°F	MGD	pH	cf/mg	MPN/100ml.	lbs.	KWH	**	
1	0	76	48	C	67	1.100	7.6	3.6		122	140		
2	.62	69	54	R	65	3.000	7.6	12.0		136	140	10	
3	0	63	54	C	65	1.500	7.3	12.0		128	140		
4	0	63	34	Cl	65	1.100	7.9	5.5	23	128	140		
5	0	72	43	C	65	1.120	7.6	3.6		66	140		
6	T	72	46	C	65	1.100	7.4	3.6		142	120		
7	0	68	56	Cl	65	1.120	7.3	3.5		132	140		
8	0	78	49	C	65	.900	7.9	2.2		112	140		
9	0	73	50	C	65	1.300	8.0	2.3		148	140	10	
10	0	77	46	C	65	1.005	7.8	3.0		144	130		
11	0	71	54	R	65	2.150	7.5	2.0	< 3	144	150		
12	1.05	63	41	C	65	1.000	7.5	48.0		104	150		
13	0	57	27	C	63	1.080	7.6	5.5		124	140	10	
14	0	65	28	C	63	.870	7.3	4.1		120	130		
15	0	71	38	C	62	.855	7.2	3.5		96.	130		
16	0	75	47	C	64	1.000	7.6	3.0		132	140		
17	.04	72	55	R	65	1.700	7.7	3.3		120	160		
18	.05	78	60	R	66	1.400	7.7	11.4	< 3	136	150		
19	.18	74	50	R	65	1.000	7.6	5.0		112	140		
20	0	59	38	C	65	1.080	7.4	5.5		104	150		
21	T	57	40	Cl	64	.970	7.3	4.1		136	140		
22	0	54	37	C	63	.855	7.6	3.5		72	130	10	
23	0	60	32	C	62	1.000	7.6	2.0		152	160		
24	.06	58	48	Cl	64	1.010	7.8	3.0		140	140		
25	0	72	51	Cl	64	.990	7.5	9.1	5.1	92	150		
26	0	78	46	C	64	.985	7.6	4.0		120	150		
27	0	69	46	C	64	1.680	7.6	3.7		130	150		
28	.46	53	36	R	64	1.500	7.3	24.0		126	160		
29	0	59	35	C	61	.855	7.4	14.0		124	140		
30	0	69	37	C	62	1.000	7.6	4.0		92	130		
31													
ARITH MEAN	2.46	78	27		64	1.175	7.6	7.1		121	142	1.3	
STAT MEAN	Tot.	Max	Min			1.200							

Dev .200 = 17%

*C—Clear CL—Cloudy R—Rain **Indicate Unit
W—Windy CA—Calm S—Snow

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MICHIGAN DEPARTMENT OF HEALTH

OPERATION REPORT OF SEWAGE TREATMENT PLANT FOR
Iron Mountain-Kingsford MICHIGAN

MONTH September 19 63

OPERATOR A. C. Christensen

PRIMARY TREATMENT DATA

Date	5-Day B.O.D. Inf Mg/l	5-Day B.O.D. Inf lbs. x10	5-Day B.O.D. Eff Mg/l	5-Day B.O.D. Eff lbs. x10	5-Day B.O.D. Rem %	Suspended Solids Inf Mg/l	Suspended Solids Inf lbs. x10	Suspended Solids Eff Mg/l	Suspended Solids Eff lbs. x10	Suspended Solids Rem %	Suspended Volatile Solids Inf Mg/l	Suspended Volatile Solids Inf lbs. x10	Suspended Volatile Solids Eff Mg/l	Suspended Volatile Solids Eff lbs. x10	Remarks
1															
2	225	562	133	332	41	426	1065	116	290	73	326	815	110	275	
3															
4	155	152	125	122	20	190	186	80	78	58	166	163	72	71	
5															
6	325	300	223	205	32	214	197	48	44	78	198	182	46	42	
7															
8	340	255	220	165	35	320	240	50	38	84	290	218	42	32	
9															
10	160	134	110	92	31	192	161	48	40	75	188	158	34	29	
11															
12	125	103	100	83	20	260	216	42	35	84	248	205	32	27	
13															
14	215	174	123	100	43	174	141	52	42	70	150	122	44	36	
15															
16	335	278	170	141	50	370	307	86	71	77	322	267	72	60	
17															
18	150	176	140	164	7	210	246	78	91	63	196	229	70	82	
19															
20	290	261	213	192	26	238	214	68	61	71	218	196	60	54	
21															
22	260	185	187	133	28	232	165	58	41	75	206	146	52	37	
23															
24	375	315	236	198	37	366	307	78	66	79	328	276	66	55	
25															
26	385	316	230	189	40	424	348	76	62	82	384	315	66	54	
27															
28	205	256	163	204	20	342	428	138	173	60	254	318	92	115	
29															
30	370	307	220	183	40	252	209	66	55	74	230	191	52	43	
31															
ARITH MEAN	261	252	173	167	31	281	295	72	79	73	247	253	61	67	
STAT MEAN	203	244	133	160	34										

Dev. 86 = 35% 40 = 25%

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MICHIGAN DEPARTMENT OF HEALTH

OPERATION REPORT of SEWAGE TREATMENT PLANT FOR

Iron Mountain-Kingsford, **MICHIGAN**

MONTH September 1963

DIGESTER AND SLUDGE DATA

OPERATOR R. C. Christensen

Date	Raw Sludge							Supernatant				sludge near bottom				Temp.	Gas		Remarks
	Gals. x10	Lbs. Per 1000 c.f. Digester	pH	Total Solids %	Vol. Solids %	Gals.	pH	Total Solids %	Vol. Solids %	Susp. Solids Mg/l	5-Day BOD Mg/l	Total Solids %	Vol. Solids %	Vol. Acids Mg/l	pH	°F	Produced cu. ft.	Wasted cu. ft.	
1	325	12.3	6.5	4.5	83.6	325	7.0					#1			7.1	96	127	80	Note – Include gallons
2	800	52.0	6.2	9.9	65.5	925	7.0	.18	49	410	270	Heated			7.1	96	86	36	of sludge to beds
3	420	21.5	6.3	8.5	60.0	420	6.9					19.4	38	26	7.0	96	75	25	
4	360	10.0	6.5	3.4	81.2	360	7.0	.18	50	326	230				7.0	96	90	37	
5	310	9.6	6.4	3.8	81.8	460	6.9								7.1	96	114	66	
6	325	13.1	6.5	5.0	81.3	325	7.0	.19	52	404	800				7.0	96	119	70	
7	335	10.7	6.4	3.7	85.9	335	7.0								7.0	96	103	54	
8	310	10.8	6.5	4.0	85.8	310	7.0	.19	50	328	740				7.1	96	95	48	
9	360	10.8	6.5	3.7	84.5	360	7.1					#2			7.1	96	94	47	
10	350	13.4	6.3	4.6	82.8	350	7.0	.18	51	252	120	No Heat			7.1	96	110	66	
11	300	10.5	6.5	4.1	85.4	300	6.9					16.8	53		7.1	96	103	51	
12	575	25.4	6.3	6.6	66.7	575	7.0	.19	50	358	250				7.0	96	102	42	
13	375	16.3	6.5	4.6	73.4	375	6.9								7.0	96	92	34	
14	335	11.1	6.4	3.9	84.4	335	7.0	.18	51	188	320				7.0	96	100	35	
15	335	12.7	6.4	4.5	83.6	460	6.8								6.9	96	77	35	
16	335	10.0	6.5	3.4	86.3	335	7.0	.20	53	298	260				6.9	96	84	37	
17	320	13.6	6.4	5.1	83.3	720	6.8							43	6.9	96	112	64	
18	475	22.2	6.5	6.9	67.5	475	6.9	.19	52	352	300				7.0	96	108	59	
19	500	12.5	6.2	5.6	78.0	500	7.0								6.9	96	110	65	
20	325	16.0	6.3	6.1	77.7	325	7.0	.18	50	270	740				7.0	96	135	57	
21	325	11.1	6.4	4.2	80.8	325	6.8								7.0	96	95	43	
22	255	7.4	6.4	3.4	84.4	255	6.9	.19	50	432	620				6.9	96	94	35	
23	395	14.0	6.5	4.2	83.8	395	7.0							39	7.1	96	100	43	
24	315	—	6.6	Lab.	acc.	315	7.0	.19	51	302	770				7.1	96	82	26	
25	300	11.0	6.5	4.6	82.5	300	7.0								7.1	96	135	82	
26	300	9.3	6.5	3.8	83.9	300	7.0	.18	48	220	760				7.1	96	110	59	
27	305	10.4	6.4	4.0	84.7	430	6.9								7.1	96	116	59	
28	475	18.0	6.5	4.9	76.7	475	6.8	.18	50	204	690				7.0	96	92	36	
29	450	22.6	6.5	7.5	67.0	575	6.8								7.0	95	102	37	
30	325	14.0	6.5	5.1	83.6	475	6.9	.17	48	158	580			51	7.0	96	114	51	
31																			
ARITH. MEAN	375	14.9	6.4	5.0	80.0	414	6.9	.19	50	300	497			40	7.0	96	104	49	
STAT. MEAN																			

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CHLORINATION RECORD
SEWAGE TREATMENT PLANT

D-3 OCT 10 1963
Sheet No. 1 of 2

Plant Operator ______ Iron Mountain, Kingsford Municipality (City or Town) Month of Sept. 1963

Date	Hour	Sewage Flow mgd	Chlorine		Date	Hour	Sewage Flow mgd	Chlorine		Date	Hour	Sewage Flow mgd	Chlorine	
			Lbs. per day	Resid. ppm				Lbs. per day	Resid. ppm				Lbs. per day	Resid. ppm
1	8:00	.7	90	3.0	7	8:00	.6	90	3.0	13	8:00	.6	75	.8
	9:00	1.6	[illegible]	2.5		9:00	1.6	70	3.0		9:00	1.0	80	1.5
	[illegible]	[illegible]	[illegible]	[illegible]		10:00	[illegible]	[illegible]	[illegible]		10:00	1.4	80	1.5
	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	1.0		11:00	1.6	80	1.5
	12:00	1.4	90	1.0		12:00	1.6	90	.8		12:00	1.7	80	.2
	1:00	1.6	[illegible]	.8		1:00	1.6	130	1.0		1:00	1.6	250	.6
	2:00	1.8	130	.8		2:00	1.6	130	.6		2:00	1.6	250	2.0
	3:00	1.8	130	[illegible]		3:00	1.8	160	.8		3:00	1.5	260	2.0
	4:00	1.8	[illegible]	.8		4:00	1.8	160	.8		4:00	1.5	250	2.0
2	8:00	.6	80	1.0	8	8:00	.6	85	1.0	14	8:00	.6	80	2.0
	9:00	.8	80	1.0		9:00	.8	85	2.0		9:00	1.0	80	2.0
	10:00	[illegible]	[illegible]	.5		10:00	[illegible]	85	2.0		10:00	1.2	80	1.5
	11:00	3.0	80	.0		11:00	1.2	85	3.0		11:00	1.4	80	.8
	12:00	5.0	150	.8		12:00	1.3	85	3.0		12:00	1.6	120	.8
	1:00	5.0	170	.6		1:00	1.4	100	2.0		1:00	1.6	150	1.0
	2:00	5.0	200	.8		2:00	1.5	140	.4		2:00	1.6	150	.8
	3:00	5.4	200	.8		3:00	1.4	240	2.0		3:00	1.8	170	.8
	4:00	5.0	200	1.0		4:00	1.4	[illegible]	[illegible]		4:00	1.8	170	.6
3	8:00	.7	80	2.0	9	8:00	.6	90	3.0	15	8:00	.6	80	2.5
	9:00	1.0	80	2.0		9:00	1.2	90	3.0		9:00	.8	80	2.5
	10:00	1.5	80	2.0		10:00	1.7	90	3.0		10:00	1.2	80	1.0
	11:00	1.8	80	2.0		11:00	2.9	90	3.0		11:00	1.4	80	.8
	12:00	2.7	80	1.5		12:00	2.7	90	.4		12:00	1.6	120	.8
	1:00	2.0	200	1.0		1:00	2.2	200	.2		1:00	1.6	140	1.0
	2:00	1.9	210	2.0		2:00	2.0	200	3.0		2:00	1.8	140	1.0
	3:00	1.8	250	1.0		3:00	1.8	280	1.0		3:00	1.8	140	.8
	4:00	1.7	280	1.5		4:00	1.7	280	1.0		4:00	1.8	140	.8
4	8:00	.7	100	.2	10	8:00	.6	90	.8	16	8:00	.6	80	.6
	9:00	1.0	100	2.0		9:00	1.0	90	3.0		9:00	1.0	70	2.0
	10:00	1.5	100	2.0		10:00	1.5	90	3.0		10:00	1.6	70	3.0
	11:00	1.6	100	3.0		11:00	1.7	90	3.0		11:00	1.8	70	3.0
	12:00	1.8	100	.4		12:00	1.7	90	.2		12:00	2.2	70	.2
	1:00	1.7	200	2.0		1:00	1.6	250	1.0		1:00	2.1	250	.1
	2:00	1.6	210	2.0		2:00	1.6	[illegible]	2.0		2:00	2.0	270	.2
	3:00	1.5	270	3.0		3:00	1.5	250	1.5		3:00	1.9	300	1.0
	4:00	1.5	240	2.0		4:00	1.5	250	3.0		4:00	1.8	300	.6
5	8:00	.7	90	2.5	11	8:00	.7	90	2.5	17	8:00	.6	70	1.5
	9:00	1.0	90	3.0		9:00	1.0	90	3.0		9:00	1.0	70	2.0
	10:00	1.5	80	3.0		10:00	1.4	90	3.0		10:00	1.5	70	3.0
	11:00	1.6	80	2.0		11:00	1.4	90	3.0		11:00	1.6	70	2.0
	12:00	1.6	80	.2		12:00	1.6	90	1.0		12:00	1.7	70	.1
	1:00	1.6	200	.2		1:00	[illegible]	120	[illegible]		1:00	1.7	230	.2
	2:00	1.5	240	.6		2:00	1.8	240	1.0		2:00	1.6	270	1.5
	3:00	1.5	270	1.5		3:00	2.0	280	.1		3:00	1.5	290	.6
	4:00	1.4	270	2.0		4:00	5.5	330	.1		4:00	1.5	290	1.5
6	8:00	.7	80	2.0	12	8:00	1.4	90	3.0	18	8:00	.8	90	0
	9:00	1.0	80	2.0		9:00	1.3	90	3.0		9:00	1.0	200	.2
	10:00	[illegible]	[illegible]	1.5		10:00	1.5	90	3.0		10:00	1.5	200	3.0
	11:00	1.4	80	.8		11:00	1.5	90	3.0		11:00	1.6	160	3.0
	12:00	1.4	120	.8		12:00	1.7	90	2.0		12:00	1.7	160	3.0
	1:00	1.6	140	.8		1:00	1.7	90	1.5		1:00	1.6	160	2.0
	2:00	1.6	160	1.0		2:00	1.6	200	3.0		2:00	1.6	160	2.0
	3:00	1.8	160	.8		3:00	1.5	260	3.0		3:00	1.5	240	2.0
	4:00	1.8	160	.6		4:00	1.5	200	2.0		4:00	1.5	240	2.0

CHLORINATION RECORD
SEWAGE TREATMENT PLANT

D-3
Sheet No. 2 of 2

Plant Operator ________ Iron Mountain, Kingsford Municipality (City or Town) Month of Sept. 1963

Date	Hour	Sewage Flow mgd	Chlorine Lbs. per day	Chlorine Resid. ppm	Date	Hour	Sewage Flow mgd	Chlorine Lbs. per day	Chlorine Resid. ppm	Date	Hour	Sewage Flow mgd	Chlorine Lbs. per day	Chlorine Resid. ppm
19	8:00	.7	90	0	25	8:00	.6	60	.8	31				
	9:00	1.0	90	2.1		9:00	1.1	80	3.0					
	10:00	1.5	250	.2		10:00	1.5	80	3.0					
	11:00	1.6	230	3.0		11:00	1.6	65	3.0					
	12:00	1.6	180	3.0		12:00	1.6	65	.1					
	1:00	1.5	180	3.0		1:00	1.6	250	.1					
	2:00	1.5	180	2.0		2:00	1.5	250	1.5					
	3:00	1.5	250	2.0		3:00	1.5	250	3.0					
	4:00	1.4	230	2.0		4:00	1.4	280	1.5					
20	8:00	.6	90	2.0	26	8:00	.6	20	0	REMARKS:				
	9:00	1.0	90	1.0		9:00	1.0	210	3.0					
	10:00	1.2	90	1.0		10:00	1.4	210	3.0					
	11:00	1.4	90	.6		11:00	1.7	180	3.0					
	12:00	1.4	130	1.0		12:00	1.8	160	2.0					
	1:00	1.6	130	.8		1:00	1.7	160	1.0					
	2:00	1.8	160	.8		2:00	1.6	160	.8					
	3:00	1.8	160	.8		3:00	1.5	160	.4					
	4:00	1.8	160	.8		4:00	1.5	250	.6					
21	8:00	.6	90	1.5	27	8:00	.6	80 0	0.1					
	9:00	1.0	90	1.0		9:00	1.0	80 0	1.0					
	10:00	1.2	90	1.0		10:00	1.4	80 0	2.0					
	11:00	1.4	90	.8		11:00	1.6	80 0	1.5					
	[illegible]	1.6	90	.4		12:00	1.6	150 0	.1					
	[illegible]	1.8	130	.6		1:00	1.5	150 60	.1					
	[illegible]	1.8	160	.8		2:00	1.5	150 100	1.0					
	[illegible]	1.5	[illegible]	.6		3:00	1.5	150 100	1.5					
	4:00	1.8	180	.8		4:00	1.4	200 80	2.0					
22	8:00	.6	110	2.0	28	8:00	.6	80 0	.8					
	9:00	.8	80	2.0		9:00	1.0	80 0	.8					
	10:00	1.0	80	3.0		10:00	2.5	80 0	.4					
	11:00	1.2	80	3.0		11:00	5.5	80 40	.6					
	12:00	1.4	120	2.0		12:00	5.0	80 60	.6					
	1:00	1.4	120	2.0		1:00	6.0	80 80	.8					
	2:00	1.4	120	1.5		2:00	5.8	80 90	.8					
	3:00	1.4	120	.8		3:00	4.2	80 90	1.0					
	4:00	1.4	120	.6		4:00	3.4	80 90	.8					
23	8:00	.6	60	0	29	8:00	.6	90 0	2.5					
	9:00	1.0	180	.1		9:00	1.0	90 0	2.5					
	10:00	1.5	180	1.0		10:00	1.0	90 0	2.0					
	11:00	2.0	180	2.0		11:00	1.4	90 0	1.5					
	12:00	2.2	160	.4		12:00	1.6	90 0	.8					
	1:00	2.1	180	.4		1:00	1.6	90 60	.8					
	2:00	1.9	280	.4		2:00	1.8	90 60	1.0					
	3:00	1.8	280	.2		3:00	1.8	90 60	1.0					
	4:00	1.7	280	2.0		4:00	1.8	90 60	1.5					
24	8:00	.6	80	.5	30	8:00	.6	70 0	1.0					
	9:00	1.0	80	.4		9:00	1.0	70 0	3.0					
	10:00	1.6	120	3.0		10:00	1.5	70 0	3.0					
	11:00	2.0	130	3.0		11:00	1.7	120 0	3.0					
	12:00	2.0	130	.1		12:00	2.1	150 0	.1					
	1:00	1.8	250	3.0		1:00	2.0	150 0	.1					
	2:00	1.7	240	3.0		2:00	1.9	160 100	3.0					
	3:00	1.7	240	2.0		3:00	1.8	200 60	2.0					
	4:00	1.7	240	3.0		4:00	1.7	200 0	2.0					

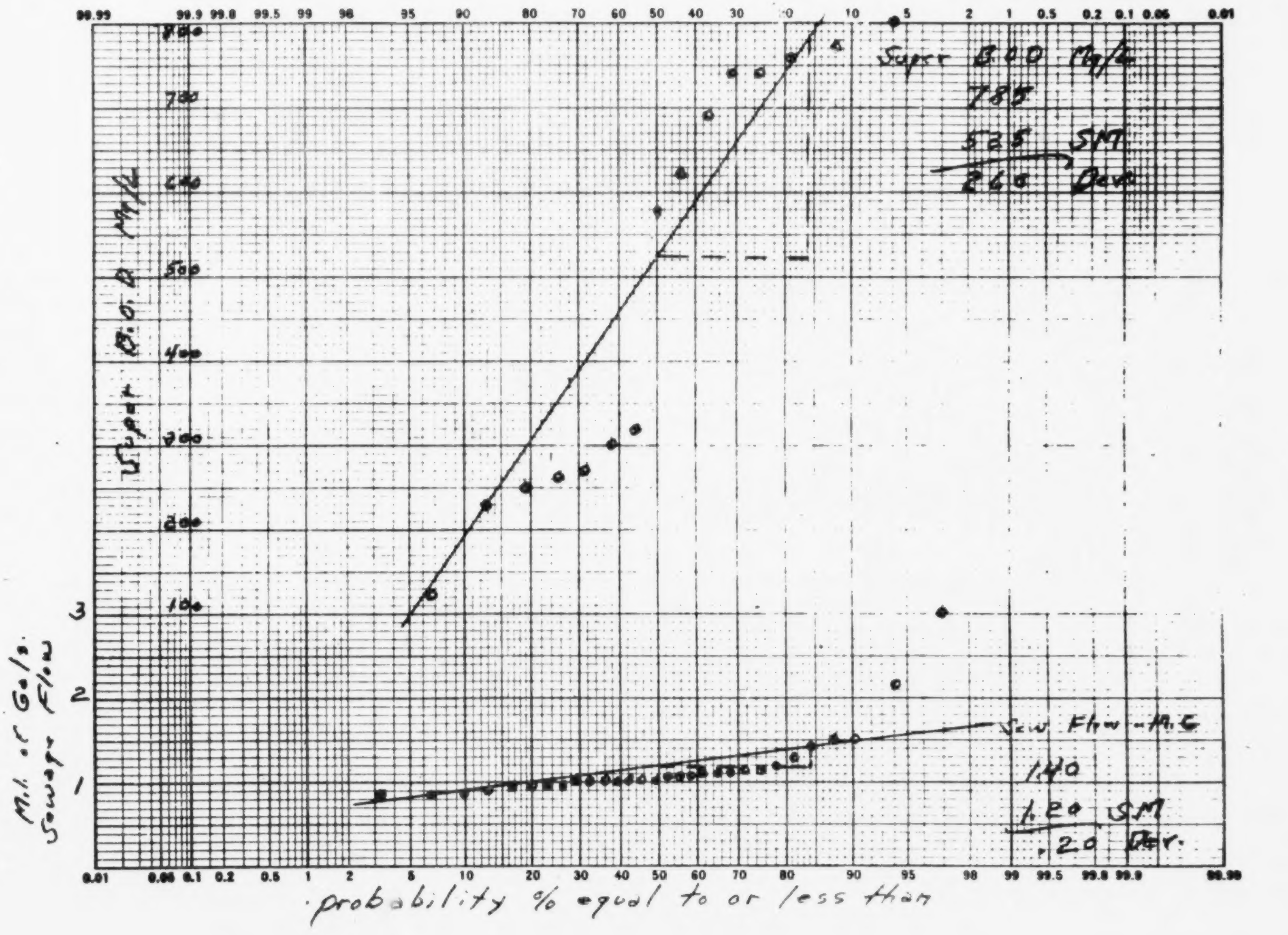
Pre. Post

D.A.O.
Michigan Department of Health

Iron Mount - , Kore Sewage plant

OCT 10 1963

September - 1963

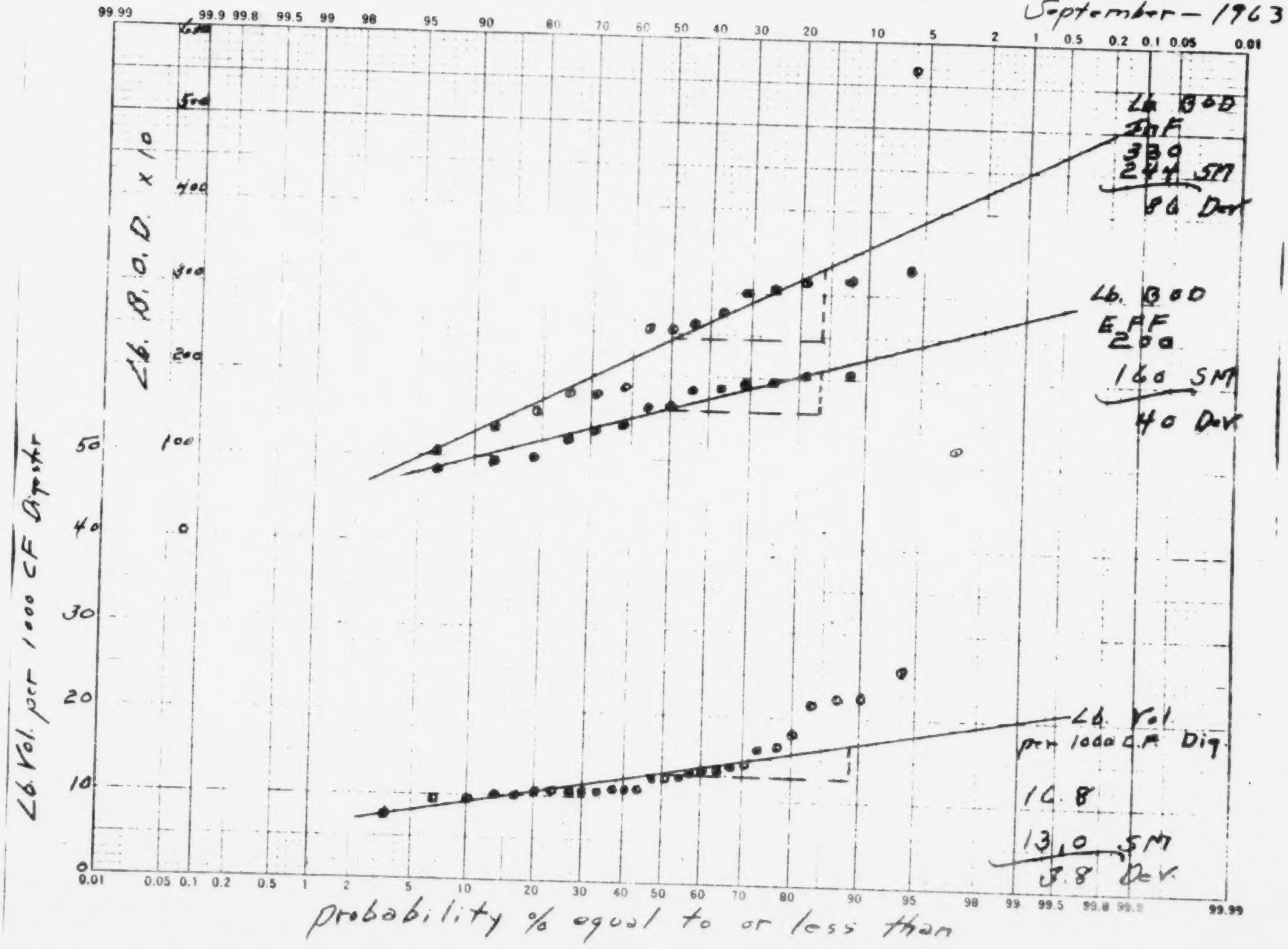


D4.6
Michigan Department of Health

Iron Mountain - Kingsford Sewage Plant

OCT 10 1963

September - 1963



APPENDIX C

HANNA MINING COMPANY

Homer-Wauseca Mine

August 30, 1962

Staff reported to the Water Resources Commission that acid mine water pumpage from old Homer-Cardiff mine had caused discoloration of Iron and Brule Rivers. Commission requested further report for its consideration at the October meeting.

October 25, 1962

Commission received report from staff that some neutralization of acid mine water is occurring in a large settling pond that was constructed by the Company. Additional neutralization measures are being investigated by the Company. Commission requested further report for its consideration at the November meeting and scheduled a conference with Company at the January meeting.

November 29, 1962

Commission received report that Company had taken no additional positive steps for control of acid mine water pumpage. Company is continuing its investigation of cost of neutralization. Commission reaffirmed its request for a conference with the Company at the January meeting for a review of the problem of mine wastes in the Iron and Brule Rivers.

January 24, 1963

Company representatives appeared before the Commission and reported on its efforts to accomplish the necessary protection of the Homer-Wauseca Mine by unwatering the glacial drift over the ore-body as a substitute for the pumping from the abandoned Homer-Cardiff mine. It was agreed that pumpage of acid mine water would cease no later than February 15 and that the Company would file a written progress report with the Commission no later than February 14.

February 4, 1963

A report was received from the Hanna Mining Company that all pumpage of water from the abandoned Homer-Cardiff mine ceased on February 1, 1963.

A comprehensive waste survey of mine pond discharge on September 3 and 4, 1963 showed the following:

Suspended Solids	8 mg/1
pH	6.8
Dissolved Iron	4.1 mg/1
Chlorides	68 mg/1
Total Flow	4.781 M.G.D.

November 20, 1963

Sampling of acid-iron mine drainage from old Homer Mine.

Ferrous Iron	2400 mg/1
Oxygen Equivalent of ferrous iron	340 mg/1
Ferric Iron	Trace
pH	4.0

October 10, 1962

Sampling of old Homer Mine pumpage.

	Suspended Solids (mg/1)	pH
1. Homer Mine at discharge pipe near old mine shaft	33	4.4
2. Settling pond effluent	28	4.2

July 18, 1962

Report of sampling.

	Suspended Solids (mg/1)	pH	Color
1. Sunset Creek at County Road 653 bridge	3	7.5	25
2. Old Homer Drainage	23	3.7	140
3. Sunset Creek below mine drainage	54	3.9	145
4. Homer-Wauseca Drainage (pond influent)	--	4.7	350
5. Homer-Wauseca pond effluent	28	4.8	120

June 19, 1962

Report from District Engineer that the Iron and Brule Rivers are highly discolored due to precipitation of dissolved iron from acid mine drainage. Contact made with Company. Following samples were collected:

	Suspended Solids (mg/1)	pH
1. Old Homer pumpage	136	3.85
2. Sunset Creek, Section 22, T. 43N., R. 35W.	104	4.1
3. New Homer-Wauseca Pond Influent	196	5.0
4. New Homer-Wauseca Pond Effluent	40	5.3
5. Iron River at County Road 653 bridge	88	4.85

October 20, 1960

Report of inspection and sampling by District Engineer. Mining Company has constructed a new mine (Homer-Wauseca) with shaft and surface buildings to replace the Homer, the Minkler and the Wauseca Mines.

About 1,300 G.P.M. of mine water is pumped from the Homer shaft into two small settling ponds from where it discharges to Sunset Creek.

Samples showed the following:

Pond Influent	120 mg/1 Suspended Solids 6.3 pH
Pond Effluent	68 mg/1 Suspended Solids 5.9 pH

About 300 G.P.M. of water from the Minkler Mine plus 1,200 G.P.M. of clean well water is pumped to a new settling pond. Pond effluent showed the following:

Suspended Solids	15 mg/1
pH	7.8

September 4 and 5, 1963

Comprehensive waste survey of mine water discharge. Twenty-four hour composite sample showed following:

Mine water discharge from Hiawatha #1 Mine:

Suspended Solids	74 mg/1
pH	6.7
Dissolved Iron	21 mg/1
Chlorides	6 mg/1
Total Flow	0.2592 M.G.D.

Hiawatha #2 Mine Pond Effluent:

Suspended Solids	143 mg/1
pH	3.1
Dissolved Iron	155 mg/1
Chlorides	440 mg/1
Total Flow	0.5659 M.G.D.

October 20, 1960

Report from Upper Peninsula District Engineer showing quantity and quality of mine pumpage from the #1 and #2 mines.

Hiawatha #1 Mine:	200 G.P.M. of underground water pumped directly to the Iron River. Water contained 46 mg/1 of Suspended Solids and had a pH of 7.6.
Hiawatha #2 Mine:	450 G.P.M. of underground water pumped to a settling pond which discharges to the Iron River. Pond effluent contained 200 mg/1 of Suspended Solids and had a pH of 4.4.

INLAND STEEL COMPANY

Sherwood Mine

September 3 and 4, 1963

Comprehensive waste survey of pond effluent. Twenty-four hour composite sample showed following:

Suspended Solids	74 mg/1
pH	3.1
Dissolved Iron	335 mg/1

Chlorides	10 mg/l
Total Flow	0.2606 M.G.D.

June 19, 1962

Sample of mine water discharge showed following:

Suspended Solids	66 mg/l
pH	2.8

September 29, 1960

Suspended Solids	84 mg/l
pH	5.4
Flow	250 G.P.M.

July 30, 1952

Sample of mine water discharge showed following:

Suspended Solids	116 mg/l
pH	2.6
Chlorides	10 mg/l

MARQUETTE IRON MINING COMPANY

Republic Mine

October 18, 1963

Comprehensive survey of mine waste discharges:

1. Tailing pond effluent ditch

Total Solids	108 mg/1
Total Volatile Solids	28 mg/1
Suspended Solids	4 mg/1
Suspended Volatile Solids	3 mg/1
pH	7.8
Dissolved Iron	0.2 mg/1
Color	10
Turbidity	2
Flow	1,257 G.P.M.

2. Outlet to Gambles Creek

Total Solids	140 mg/1
Total Volatile Solids	50 mg/1
Suspended Solids	19 mg/1
Suspended Volatile Solids	5 mg/1
pH	7.2
Dissolved Iron	1.4 mg/1
Color	20
Turbidity	20
Flow	4,875 G.P.M.

July 12, 1962

Report of inspection by Upper Peninsula District

Engineer. Mine waste pond discharge clean and clear in appearance; pH of this water was 8.0. The Michigamme River below the waste discharge was clean and clear.

HANNA MINING COMPANY

Groveland Mine

October 18, 1963

Comprehensive survey of mine waste discharges:

Total Solids	636 mg/1
Total Volatile Solids	214 mg/1
Suspended Solids	10 mg/1
Suspended Volatile Solids	7 mg/1
pH	7.8
Dissolved Iron	0.1 mg/1
Color	25
Turbidity	6
Flow	112 G.P.M.

July 25, 1963

Report of inspection by Upper Peninsula District Engineer. Water in both tailings ponds and overflow into Pine Creek appeared clean and clear. No color or turbidity visible. Numerous minnows and small fish observed along edges of tailings ponds and in the outlet to Pine Creek. Ducks observed in ponds. Company presently engaged in making study of adequacy of ponds for future tailings storage requirements.

December 29, 1960

Report of inspection and sampling from District Engineer. Report states overflow from both ponds was clear with no color or apparent turbidity. Effluent from last pond in series which discharges to Pine Creek showed following:

Suspended Solids	13 mg/1
pH	7.6

Water is pumped from this pond for re-use in the processing of ore.

July 2, 1959

Report from District Engineer. Both ponds full. Last pond in series just starting to spill over. Tailings settling out in a small area near the influent line to the first pond. Overflow clear. Company recirculating water from the second pond in series.

WHITE HOUSE MILK COMPANY

July 2 and 3, 1963

Report of comprehensive waste survey. Twenty-four hour composite of effluent from trickling filter waste treatment plant showed following:

Waste Flow	0.05 M.G.D.
Pounds of 5-day B.O.D.	240 lbs.
Pounds of Suspended Solids	208 lbs.
Pounds of Suspended Volatile Solids	69 lbs.

Pounds of 5-day B.O.D. per 1,000 lbs. of milk processed:	0.86 lbs.
Gallons of waste per 1,000 lbs. of milk intake:	180 gallons

Following is a summary of five additional comprehensive waste surveys which have been conducted at this plant since 1958.

	9-1-60	6-29-60	10-21-59	6-25-59	7-15-58
Pounds of 5-day B.O.D. discharged	46	203	131	141	15
Pounds of 5-day B.O.D. per 1,000 lbs. of milk	0.28	0.98	0.83	0.60	0.90
24-hour waste flow (M.G.D.	0.0396	0.0677	0.0432	0.0403	0.0170

SCOTT PAPER COMPANY

Menominee Groundwood Mill

July 18 and 19, 1963

A comprehensive waste survey was conducted at this mill. Following is a summary of the wastes discharged during the 24-hour survey period:

Pounds of 5-day B.O.D.	909 lbs.
Pounds of Suspended Solids	5,190 lbs.
Pounds of Suspended Volatile Solids	5,230 lbs.*
Total Waste Flow (M.G.D.)	

*Credit was given for suspended solids in the Menominee River water supply which explains the apparent higher volatile solids load than suspended solids load.

MARATHON

October 8 and 9, 1963

A comprehensive survey showed the following waste constituents discharged to the Menominee River during the 24-hour survey period:

Pounds of 5-day B.O.D.	4,413 lbs.
Pounds of Suspended Solids	9,866 lbs.
Pounds of Suspended Volatile Solids	5,264 lbs.
Total Waste Flow (M.G.D.)	1.579

June 6 and 7, 1963

A comprehensive waste survey showed the following waste constituents discharged to the river during the 24-hour survey period.*

Pounds of 5-day B.O.D.	5,416 lbs.
Pounds of Suspended Solids	14,479 lbs.
Pounds of Suspended Volatile Solids	9,024 lbs.
Total Waste Flow (M.G.D.)	1.832

September 10 and 11, 1958

A comprehensive waste survey showed the following wastes discharged during the 24-hour waste survey period:

Pounds of 5-day B.O.D.	1,668 lbs.
Pounds of Suspended Solids	5,489 lbs.
Pounds of Suspended Volatile Solids	3,975 lbs.
Total Waste Flow (M.G.D)	1.226

*Waste survey results not representative of normal operating conditions. Excessive losses of paper solids occurred as the result of a 4½ hour breakdown in the mill during the period of survey.

July 12 and 13, 1951

A 24-hour comprehensive waste survey conducted showed the following:

Pounds of 5-day B.O.D.	1,890 lbs.
Pounds of Suspended Solids	3,646 lbs.
Pounds of Suspended Volatile Solids	2,342 lbs.
Total Waste Flow (M.G.D.)	1.512

APPENDIX D

STREAM SAMPLING SURVEYS

Following is a tabulation of samples collected by staff of the Water Resources Commission from the Iron, Brule and Menominee Rivers on October 14, 1963:

Location	Total Solids mg/l	Susp. Solids mg/l	Susp. Vol. Solids mg/l	pH	Fe^{+++} mg/l	Fe^{++} mg/l	Turbidity	Color	Chlorides mg/l
Iron River near Iron River Township Hall off County Rd. 657	145	6	4	8.0	0.0	0.0	2	10	0
Iron River; County Rd. 653 bridge	350	5	5	7.8	0.3	0.0	2	10	7
Iron River; County Rd. 424 bridge	410	29	12	7.3	4.8	0.0	28	5	16
Iron River, at mouth	390	21	10	7.6	2.5	0.0	18	5	16
Brule River; just above mouth of Iron	120	3	3	8.1	0.1	0.0	2	10	0
Brule River; Wis.-Mich. Br. at Scott Lake	195	6	3	7.9	0.6	0.0	5	10	3
Brule River; Wis.-Mich. Br. at Pentoga	230	10	5	8.2	0.4	0.0	8	10	5
Brule River; Wis.-Mich. Br. south of Alpha	230	7	5	8.3	0.3	0.0	5	10	4
Brule River; Wis.-Mich. Br. U.S. 2 & U.S. 141	220	6	4	8.3	1.4	0.0	5	10	4
Brule River; USGS Gage north of Florence	220	4	4	8.3	0.3	0.0	3	10	4

STREAM SAMPLING SURVEYS (continued)

Location	Total Solids mg/l	Susp. Solids mg/l	Susp. Vol. Solids mg/l	pH	Fe^{+++} mg/l	Fe^{++} mg/l	Turbidity	Color	Chlorides mg/l
Menominee River; Wis.-Mich. Br. U.S. 2 & U.S. 141	125	3	3	8.0	0.1	0.0	5	15	2
Menominee River; Wis.-Mich. Br. M-95 in Kingsford	130	5	3	7.9	0.1	0.0	5	15	2
Menominee River; U.S. 141 Br. near Niagara	130	5	3	7.9	0.1	0.0	4	20	2
Menominee River; U.S. 8 Br. south of Norway	130	12	11	7.7	0.1	0.0	7	20	2
Menominee River; R.R. Br. at Faithorn	135	13	10	7.6	0.1	0.0	5	20	2

SUMMARY TABULATIONS

Following is a summary tabulation of results of stream sampling surveys of the Iron, Brule and Menominee rivers carried out by staff since 1951. Sampling station numbers used in the tabulations refer to the following locations:

Station No.	Location
1	Iron River - Road bridge on N & S road in Section 16, about 3 miles northwest of Iron River.
2	Iron River - On County road 653 bridge NW of Iron River.
3	Iron River - On County road 424 bridge at the south edge of Caspian.
4	Iron River - On railroad bridge just south of Caspian.
5	Iron River - Mouth of the river at the Brule River.
6	Brule River - Wis.-Mich. bridge on highway M-189.
7	Brule River - Just above the mouth of the Iron River.
8	Brule River - At Wis.-Mich. bridge at Scott Lake.
9	Brule River - At Wis.-Mich. bridge at Pentoga.
10	Brule River - At Wis.-Mich. bridge on Highways U.S. 2 & U.S. 141.
11	Brule River - At USGS Gage house north of Florence, Wis.
12	Brule River - At Brule Island Dam north of Florence, Wis.
13	Menominee River - At Wis.-Mich. bridge on Highways U.S. 2 & U.S. 141.
14	Menominee River - At Wis.-Mich. bridge on Highway M-95.
15	Menominee River - At Wis.-Mich. bridge on Highway U.S. 141
16	Menominee River - At Wis.-Mich. bridge on Highway U.S. 8.
17	Menominee River - At Railroad bridge west of Faithhorn.
18	Menominee River - At interstate bridge west of Nathan.
19	Menominee River - At Grand Rapids dam west of Ingalls.
20	Menominee River - At interstate bridge west of Wallace.
21	Menominee River - Above Scott Paper Company Groundwood Mill.
22	Menominee River - At Hattie Street bridge in Menominee.
23	Menominee River - At Sheridan Road bridge in Menominee.
24	Menominee River - Below Marathon Paper Company outlet. (Shore end of breakwater)

SUMMARY TABULATION OF PARTIAL CHEMICAL ANALYSIS - IRON - BRULE - MENOMINEE (mg/l)

River	Station	Date	Fe^{+++}	Fe^{++}	Chlorides	Color	Turbidity	Total Solids	Total Volatile Solids	Suspended Solids	Suspended Volatile Solids	pH
		1963										
Iron	1	Sept. 18	0.4	.0	0	5	2	---	---	---	---	---
Iron	2	Sept. 18	1.2	.0	6	15	8	---	---	---	---	---
Iron	3	Sept. 17	4.2	.0	12	10	20	---	---	---	---	---
Iron	5	Sept. 18	4.0	--	15	5	20	---	---	---	---	---
Brule	7	Sept. 18	0.1	.0	0	10	2	---	---	---	---	---
Brule	9	Sept. 18	0.8	.0	4	10	12	---	---	---	---	---
Brule	10	Sept. 17	0.9	.0	4	10	7	---	---	---	---	---
Brule	11	Sept. 17	0.6	.0	2	10	4	---	---	---	---	---
Menominee	19	Sept. 9	0.2	--	3	25	0	---	---	---	---	---
Menominee	20	Sept. 9	0.2	--	2	25	0	---	---	---	---	---
Menominee	21	Sept. 9	0.2	--	3	30	0	---	---	---	---	---
Menominee	22	Sept. 9	L.1/3 0.5 R.1/3 0.3	--	L.1/3 4 R.1/3 4	L.1/3 40 R.1/3 40	L.1/3 0 R.1/3 0	---	---	---	---	---
Menominee	23	Sept. 9	0.3 0.3	--	3 4	35 35	0 0	---	---	---	---	---
Menominee	24	Sept. 9	0.3	--	2	35	0	---	---	---	---	---
Iron	2	April 10	---	--	---	---	---	266	70	6	0	---
Iron	3	April 10	---	--	---	---	---	370	62	42	0	---
Brule	9	April 10	---	--	---	---	---	158	50	14	0	---
Brule	11	April 10	---	--	---	---	---	364	66	16	0	---

River	Station	Date 1962	Fe+++	Fe++	Chlorides	Color	Turbidity	Total Solids	Total Volatile Solids	Suspended Solids	Suspended Volatile Solids	pH
Iron	2	Oct. 10	---	--	---	---	---	---	---	56	26	5.5
Iron	3	Oct. 10	---	--	---	---	---	---	---	40	4	5.3
Iron	5	Oct. 10	---	--	---	---	---	---	---	56	26	5.3
Brule	9	Oct. 10	---	--	---	---	---	---	---	44	0	7.0
Brule	10	Oct. 10	---	--	---	---	---	---	---	14	0	7.6
Brule	11	Oct. 10	---	--	---	---	---	---	---	24	0	7.8
Iron	1	July 18	---	--	---	15	---	---	---	15	3	7.85
Iron	2	June 19	---	--	---	---	---	---	---	88	---	4.85
Iron	2	July 18	---	--	---	124	---	---	---	36	8	4.58
Iron	3	July 18	---	--	---	310+	---	---	---	132	42	4.64
Brule	9	July 18	---	--	---	320	---	---	---	86	26	6.5
Brule	10	July 18	---	--	---	83	---	---	---	38	13	7.3
Brule	11	July 18	---	--	---	93	---	---	---	37	14	7.4

SUMMARY TABULATION OF DISSOLVED OXYGEN CONCENTRATIONS (mg/l)

River	Station	May 7, 1951	August 6, 1951	November 5, 1951	July 31, 1957	August 29, 1963	September 9, 1963	September 18, 1963
IRON	1	9.2	7.4	11.4	9.4	7.0		10.4
	2	---	---	---	---	---	---	9.2
	3	---	---	---	10.0	8.0	---	9.6
	4	10.0	8.2	12.2	---	---	---	---
	5	---	---	---	9.4	8.0	---	8.2
BRULE	6	9.6	8.2	13.0	9.0	---	---	---
	7	---	---	---	---	8.2	---	8.8
	8	9.6	---	---	---	---	---	---
	9	---	8.0	12.8	9.6	8.2	---	10.4
	10	9.8	8.4	12.8	7.8	9.4	---	9.2
	11	---	---	---	---	9.5	---	---
	12	---	---	---	---	8.3	---	---
MENOMINEE	13	10.2	6.4	12.2	7.0	7.6	---	---
	14	10.0	6.6	11.4	---	7.8	---	---
	15	9.6	5.2	12.0	6.4	7.8	---	---
	16	9.6	6.0	12.4	---	6.0	---	---
	17	9.4	4.6	12.4	---	---	---	---
	18	9.0	5.8	12.6	---	---	---	---
	19	---	---	---	---	---	6.4	---
	20	8.8	5.0	12.4	---	---	7.0	---
	21	---	---	---	---	---	6.6	---
	22	9.2	6.6	13.4	---	---	L.1/3 5.4 R.1/3 5.2	---
	23	9.2	6.2	13.4	---	---	4.8 5.0	---
	24	---	---	---	---	---	4.8	---

SUMMARY TABULATION   FIVE-DAY BIOCHEMICAL OXYGEN DEMAND (mg/l)

River	Station	May 7, 1951	August 6, 1951	November 5, 1951	July 31, 1957	August 29, 1963	September 9, 1963	September 18, 1963
IRON	1	1.8	0.6	1.4	1.6	0	---	2.1
	2	---	---	---	---	---	---	.9
	3	---	---	---	3.0	0.3	---	2.2
	4	10.2	34.0	26.0	---	---	---	---
	5	---	---	---	4.2	0.3	---	2.8
BRULE	6	3.2	1.8	2.2	1.4	---	---	---
	7	---	---	---	---	0.6	---	1.1
	8	6.0	---	---	---	---	---	---
	9	---	4.0	1.8	3.6	0.6	---	1.4
	10	4.4	1.2	2.2	1.8	0	---	1.2
	11	---	---	---	---	0.1	---	---
	12	---	---	---	---	0	---	---
MENOMINEE	13	3.6	1.6	1.4	1.2	0.6	---	---
	14	10.2	0.4	6.2	---	0.8	---	---
	15	17.8	4.0	1.6	6.0	0.6	---	---
	16	11.8	8.8	9.2	---	10.0	---	---
	17	4.4	4.2	8.8	---	---	---	---
	18	4.4	1.8	9.2	---	---	---	---
	19	---	---	---	---	---	0	---
	20	2.4	0	12.8	---	---	0	---
	21	---	---	---	---	---	0	---
	22	19.4	0	8.4	---	---	L.1/3 4.4 R.1/3 4.2	---
	23	7.0	1.0	11.7	---	---	4.6 4.4	---
	24	---	---	---	---	---	3.8	---

SUMMARY TABULATION OF COLIFORM M.P.N.

River	Station	May 7, 1951	August 6, 1951	November 5, 1951	August 23, 1960	July 18, 1962	August 29, 1963	September 9, 1963	September 26, 1963
IRON	1	93	14,000	1,200	230	110	230	---	**430**
	2	---	---	---	---	---	---	---	**75**
	3	---	---	---	---	150	9,300	---	**240,000**
	4	93,000	23,000	110,000	43,000	---	---	---	**460,000**
	5	---	---	---	---	---	75,000	---	**93,000**
BRULE	6	93	150	93	773	---	---	---	**---**
	7	---	---	---	---	---	230	---	**91**
	8	910	---	---	9,300	---	---	---	**24,000**
	9	---	43,000	4,300	---	73	4,300	---	**24,000**
	10	4,600	110,000	1,200	230	1,500	4,300	---	**4,300**
	11	---	---	---	---	1,500	4,300	---	**930**
	12	---	---	---	---	---	2,400	---	**---**
MENOMINEE	13	430	640	230	430	---	91	---	**36**
	14	< 4,300	930,000	1,500	93	---	91	---	**36**
	15	930	150,000	9,300	2,300	---	2,400	---	**---**
	16	11,000	75,000	9,300	15,000	---	43,000	---	**---**
	17	2,400	43,000	14,000+	750	---	---	---	**---**
	18	2,400	7,500	4,600	930	---	---	---	**---**
	19	---	---	---	---	---	---	36	**---**
	20	430	2,300	4,600	230	---	---	36	**---**
	21	---	---	---	---	---	---	230	**---**
	22	< 430	15,000	910	230	---	---	L.1/3 < 3 R.1/3 36	**---**
	23	1,500	210,000	23,000	23,000	---	---	24,000 4,300	**---**
	24	---	---	---	---	---	---	4,300	**---**

TABLE I

MEAN COLIFORM DENSITIES* - RAW WATER
Green Bay - Menominee
1948 to date

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Max.	Min.	Med.
1948	1,600	140	130	230	27	41	112	230	360	650	18,000	1,200	18,000	27	230
1949	3,000	730	68	160	70	85	110#	125#	190	8,000	3,800	1,200	8,000	68	175
1950	800	275	270	560	62	200	165	180	170#	1,100	840	800	1,100	62	272
1951	105	190	220	180	7.3#	47	140	125	500	1,150	2,200	930	2,200	7.3#	185
1952	740	75	120	200	33	240	130	140	1,400	43,000	3,800	320	43,000	33	220
1953	460	200	240	100	60	100	165	210	1,350	14,500	3,050	640	14,500	60	225
1954	210	190	135	300	63	28#	140	185	420	1,250	1,450	370	1,450	28	200
1955	630	155	135	130	190	73	220	750	2,000	1,600	410	200	2,000	73	210
1956	60	110	95	160	360	230	315	325	385	560	450	270	560	60	293
1957	142	70	125	310	105	107	170	400	380	280	700	310	700	70	225
1958	81	43	61	148	112	134	145	220	390	720	600	153	720	43	147
1959	27	10	15	38#	75	135	500	1,200	1,130	460	340	205	1,200	10	168
1960	85	18	19	255	285	280	375	1,100	1,700	370	465	150	1,700	18	283
1961	23	15	35	118	39	130	480	1,800	220	650	480	135	1,800	15	133
1962	24	8.2	23	54	47	100	345	390	195	180#	185#	91#	390	8.2	95
1963	5.9#	4.7#	5.9#	39	45	77	550	610	290						
Max.	3,000	730	270	560	360	280	500	1,800	2,000	43,000	18,000	1,200	43,000		
Min.	5.9	4.7	5.9	38	7.3	28	110	125	170	180	185	91		4.7	
Med.	124	92	107	160	63#	107	165	230	390	720	700	310	700	63	163

*M.P.N. per 100 ml

#Minimum values

Maximum values are underlined

TABLE 2

PUBLIC WATER SUPPLIES
in the
MICHIGAN PORTION OF THE MENOMINEE RIVER BASIN

Location	Population Served	Source
BARAGA COUNTY		
Spurr Township		
Imperial Heights	--	Infiltration tiles
DICKINSON COUNTY		
Breitung Township		
Quinnesec	400	Wells in drift
Iron Mountain	9,299	Mine shaft in rock (summer) Lake Antoine (winter)
Kingsford	5,084	From Iron Mountain
Norway	3,171	Wells in drift Lake Forrest
Norway Township	1,022	From City of Norway
Sagola Township		
Sagola	150	Drilled well
IRON COUNTY		
Alpha	317	Two wells
Bates Township	1,224	Wells in drift
Caspian	1,493	Wells in drift
Crystal Falls	2,203	Wells in drift
Crystal Falls Township	1,443	Wells - part from City of Crystal Falls
Gaastra	582	Well
Hematite Township		
Amasa	500	Wells in drift
Iron River	3,754	Wells in drift
Iron River Township		
Beechwood District	500	Well in drift
Nash District	1,200	Well in drift
Rodine Road System	400	Well in drift
Mineral Hills	311	From Iron River Township
Stambaugh	1,876	Well in drift
Stambaugh Township	1,092	Two wells
South Brule District	--	Well in drift
MARQUETTE COUNTY		
Republic Township		
Republic	1,417	Perch Lake
MENOMINEE COUNTY		
Menominee	11,289	Green Bay
Stephenson	820	Wells in rock

From - Michigan Department of Health
Engineering Bulletin No. 4

TABLE 3

INDUSTRIAL WATER USE

in the

MICHIGAN PORTION OF THE MENOMINEE RIVER BASIN

Location	Industry	Source	Water use in gallons per day Manufacturing	Cooling	Sanitary	Other	Total
Carney	Frigo Brothers	Wells	26,000	40,000	2,000	---	68,000
Daggett	Daggett Cheese Co.	----	---	---	---	---	---
Iron River	Hanna Mining Co.	Iron River Twp.	---	---	30,000	27,000	57,000
		City of Stambaugh	---	---	12,500	15,500	28,000
		Iron River	---	---	---	670,000	685,000
	Inland Steel Co.	Village of Mineral Hills	---	---	4,000	18,000	22,000
Menominee	Marathon Corporation	City of Menominee & Menominee River	1,800,000	6,700,000	1,800	136,500	9,137,300
	Scott Paper Company	----	---	---	---	---	---
Randville	Hanna Mining Company	West Branch Sturgeon River & 1 well	---	---	17,000	1,900,000	1,917,000
Republic	Marquette Iron Mining Company	Michigamme River & Republic Twp.	---	1,440,000	25,000	18,720,000	20,185,000
Stephenson	White House Milk Co.	Well & Village of Stephenson	60,000	300,000	2,000	---	362,000

TABLE 4

HYDROELECTRIC PLANTS

in the

MICHIGAN PORTION OF THE MENOMINEE RIVER BASIN

River	Plant	Owner	Head feet	Horsepower	Installed Capacity KW
Brule	Brule	Wisconsin Michigan Power Company	63	9,300	5,335
Michigamme	Hemlock Falls	Wisconsin Michigan Power Company	34	3,800	2,800
	Michigamme Falls	Wisconsin Michigan Power Company	60	13,000	9,600
	Peavy Falls	Wisconsin Michigan Power Company	95	21,400	15,000
	Way Dam	Wisconsin Michigan Power Company	38	2,500	1,800
	Republic	Cleveland Cliffs Iron Company	23	800	640
Menominee	Twin Falls	Wisconsin Michigan Power Company	44	9,300	5,740
	Kingsford	Wisconsin Michigan Power Company	30	9,600	7,200
	Big Quinnesec Falls (old)	Wisconsin Michigan Power Company	61	5,600	3,530
	Big Quinnesec Falls (new)	Wisconsin Michigan Power Company	92	22,000	16,000
	Chalk Hill	Wisconsin Michigan Power Company	28	11,250	7,800
	White Rapids	Wisconsin Michigan Power Company	29	11,870	8,000
	Grand Rapids	Wisconsin Public Service Corporation	28	10,000	7,020
	Menominee (Upper)	Marinette Paper Company	15	4,652	1,200
	Menominee (Lower)	Marinette Paper Company	12	3,748	
	Sturgeon Falls	City of Norway	26	7,200	3,500
Sturgeon	Sturgeon	Wisconsin Michigan Power Company	66	1,170	800
Paint	Crystal Falls	Crystal Falls Light & Water Dept.	21	--	900
	Lower Paint	Wisconsin Michigan Power Company	20.5	155	100

TABLE 5

BASIC DATA ON SEWERAGE SYSTEMS FOR MICHIGAN COMMUNITIES

Menominee River Basin
1963

River	Town	1960 Pop.	Percent Sewered	Sewer Type	Population Sewered	Design Pop. Equiv.	Treatment	Effluent Chlorinated
Menominee	Iron Mountain) Kingsford)	9,299 5,084	100	Comb.	9,299 5,084	20,000	Primary	Yes
	Menominee	11,289	100	Sep. & Comb.	11,289	12,000	Primary	Yes
	Norway	3,171	100	Comb.	3,171	---	None	
Little Cedar	Daggett	296	0		0	---	Septic tank & tile field	
	Stephenson	820	100	Sep.	820	1,500	Secondary	Yes
Michigamme	Republic Townsite*	200	100	Sep.	200		Primary	Yes
Brule Sub Basin								
Paint	Crystal Falls	2,203	95	Comb.	2,092	---	None	
Armstrong Cr.	Alpha	317	100	Comb.	317	500	Primary	No
Iron	Caspian	1,493	90	Sep.	1,344	1,400	Primary	No
	Gaastra	582	100	Sep.	582	700	Primary	No
	Iron River	3,754	100	Comb.	3,754	5,000	Primary	Yes
	Mineral Hills	311	75	Sep.	230		Septic tank & tile field	No
	Stambaugh	1,876	100	Sep.	1,876	3,000	Secondary	Yes
		40,695			40,138			

*Unincorporated

TABLE 6

STATUS OF POLLUTION CONTROL

ALL MICHIGAN COMMUNITIES

Menominee River Basin

River	Community	Pop. (1960)	Adequacy of Pollution Control
Menominee	Iron Mt. and Kingsford	14,383	Adequate
	Menominee	11,289	Adequate
	Norway	3,171	Under surveillance and appraisal - Unlawful pollution not established
Little Cedar	Daggett	296	Adequate - Private systems
	Stephenson	820	Additions under construction - Adequate when completed 1963
Michigamme	Republic Townsite	200	Adequate
Paint	Crystal Falls	2,203	Under surveillance and appraisal - Unlawful pollution not established
Armstrong Creek	Alpha	317	Adequate except for disinfection - to be installed 1964
Iron	Caspian	1,493	Adequate except for disinfection - to be installed 1964
	Gaastra	582	Adequate except for disinfection - to be installed 1964
	Iron River	3,754	Adequate - Virgil location to be intercepted 1964
	Mineral Hills	311	Some localized pollution mainly in ditches. To be corrected 1964
	Stambaugh	1,876	Adequate

FIGURE 1

FLOW DURATION CURVE

MENOMINEE RIVER BELOW KOSS

1914-1962

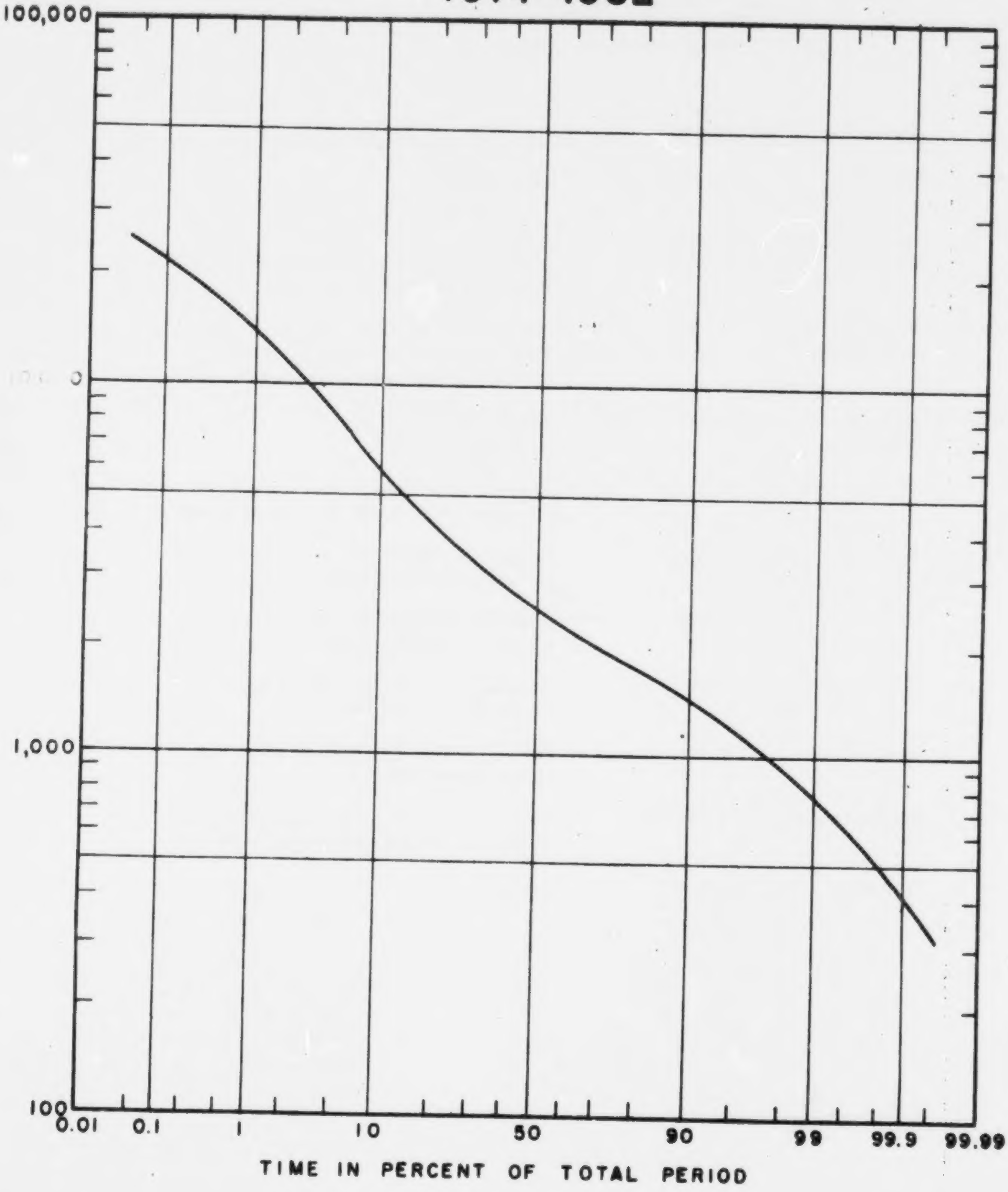


FIGURE 2

MENOMINEE RIVER BELOW KOSS

DROUGHT DURATION VS. SEVERITY

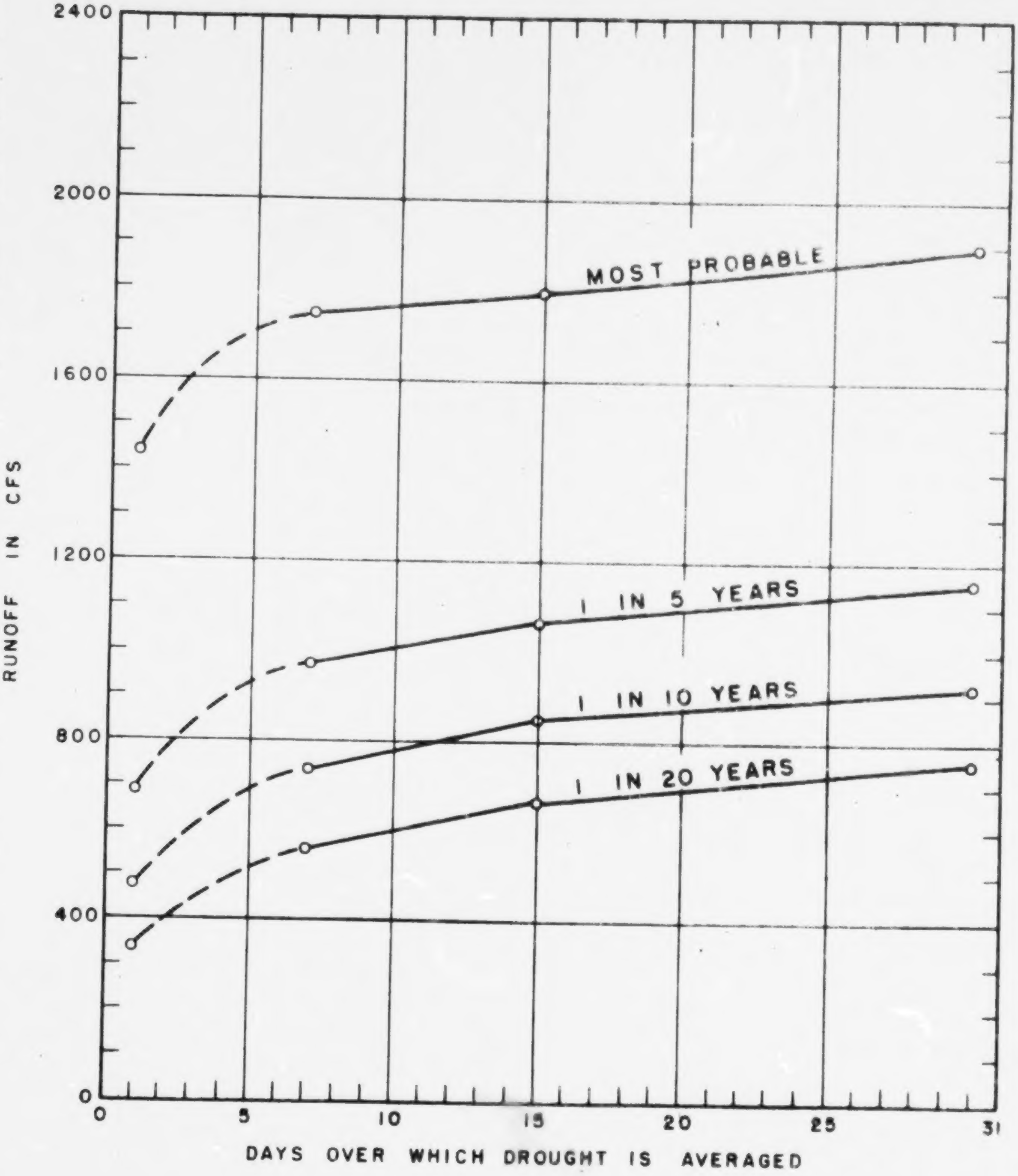


FIGURE 3

SPORT FISHING

MENOMINEE RIVER SYSTEM

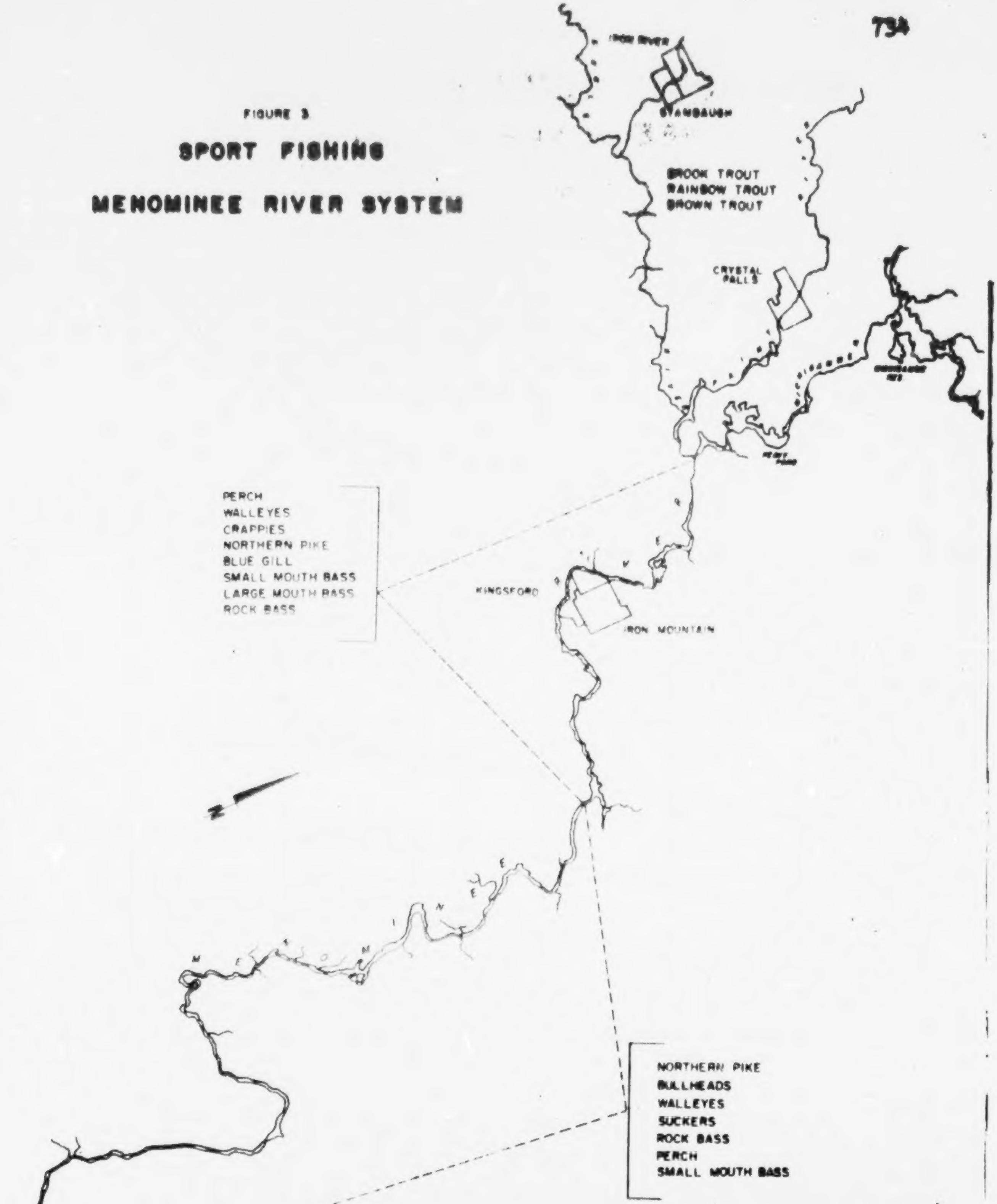

IRON RIVER
STAMBAUGH
BROOK TROUT
RAINBOW TROUT
BROWN TROUT
CRYSTAL FALLS
PEAVY POND
PERCH
WALLEYES
CRAPPIES
NORTHERN PIKE
BLUE GILL
SMALL MOUTH BASS
LARGE MOUTH BASS
ROCK BASS
KINGSFORD
IRON MOUNTAIN
N
M E N O M I N E E
NORTHERN PIKE
BULLHEADS
WALLEYES
SUCKERS
ROCK BASS
PERCH
SMALL MOUTH BASS
MENOMINEE

FIG. 4

MENOMINEE RIVER BASIN
AND ITS
TRIBUTARIES IN MICHIGAN

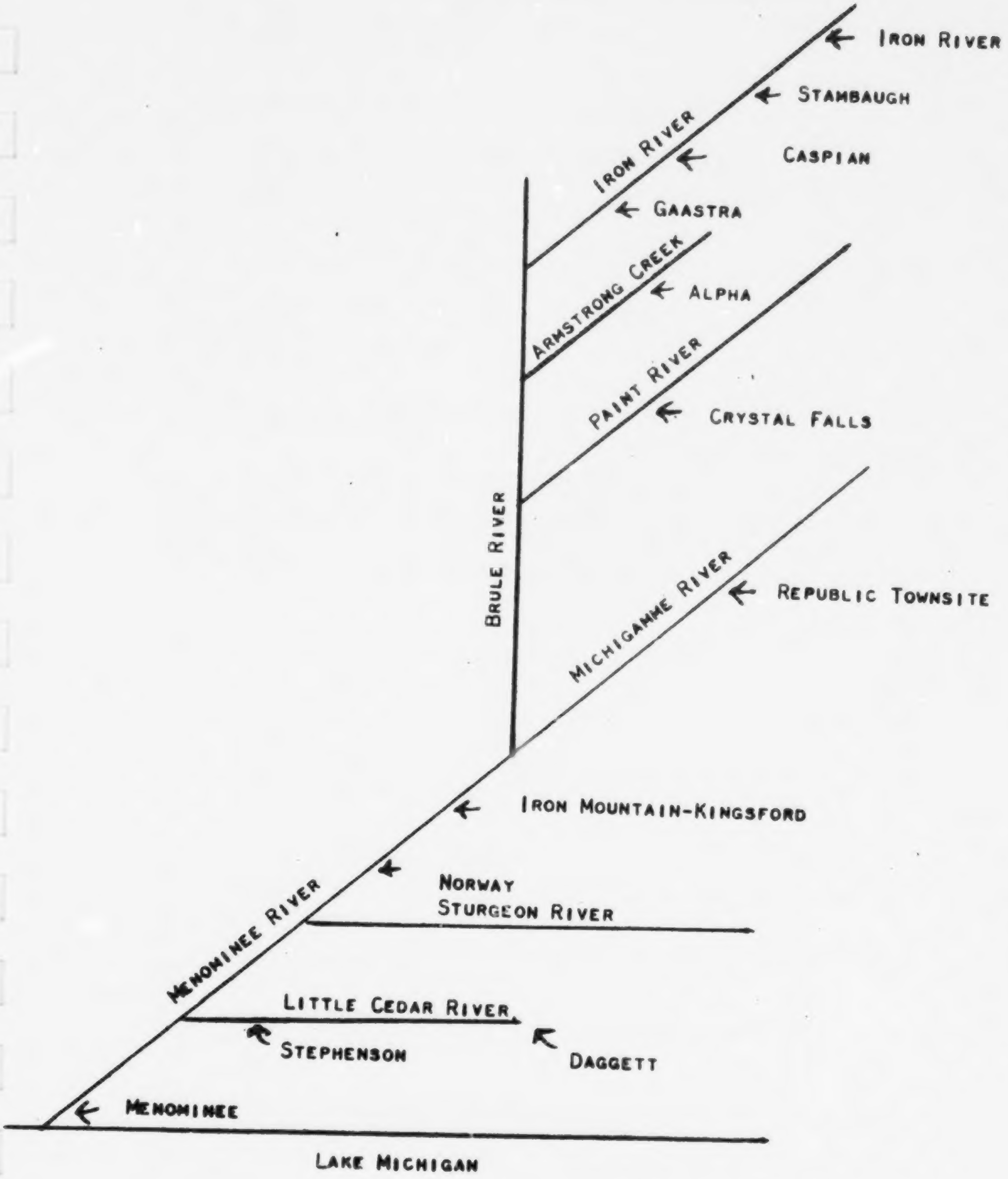
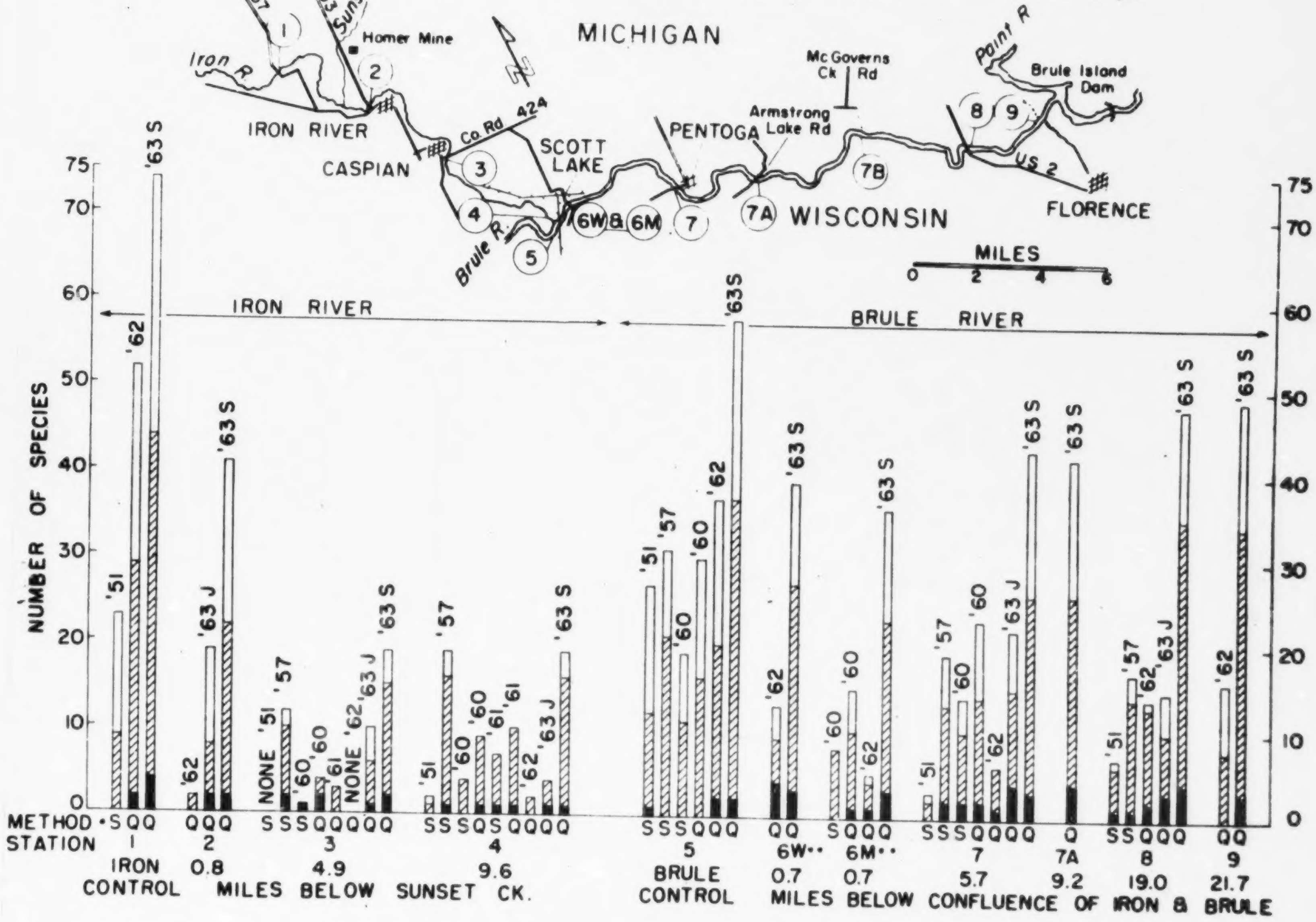

IRON RIVER
STAMBAUGH
IRON RIVER
CASPIAN
GAASTRA
ARMSTRONG CREEK
ALPHA
PAINT RIVER
CRYSTAL FALLS
BRULE RIVER
MICHIGAMME RIVER
REPUBLIC TOWNSITE
IRON MOUNTAIN-KINGSFORD
NORWAY
STURGEON RIVER
MENOMINEE RIVER
LITTLE CEDAR RIVER
STEPHENSON
DAGGETT
MENOMINEE
LAKE MICHIGAN

Figure 5. Number of aquatic macroinvertebrate species collected, Iron and Brule Rivers, vicinity Iron River, Michigan to Florence, Wisconsin, surveys of 1951, 1957, 1960, 1961, 1962, 1963J (June) and 1963S (September). Tolerance status of organisms indicated by ■ = tolerant, ▨ = facultative, and [ ] = intolerant. *S = Surber square foot, Q = qualitative collection. **W = [illegible], M = [illegible]



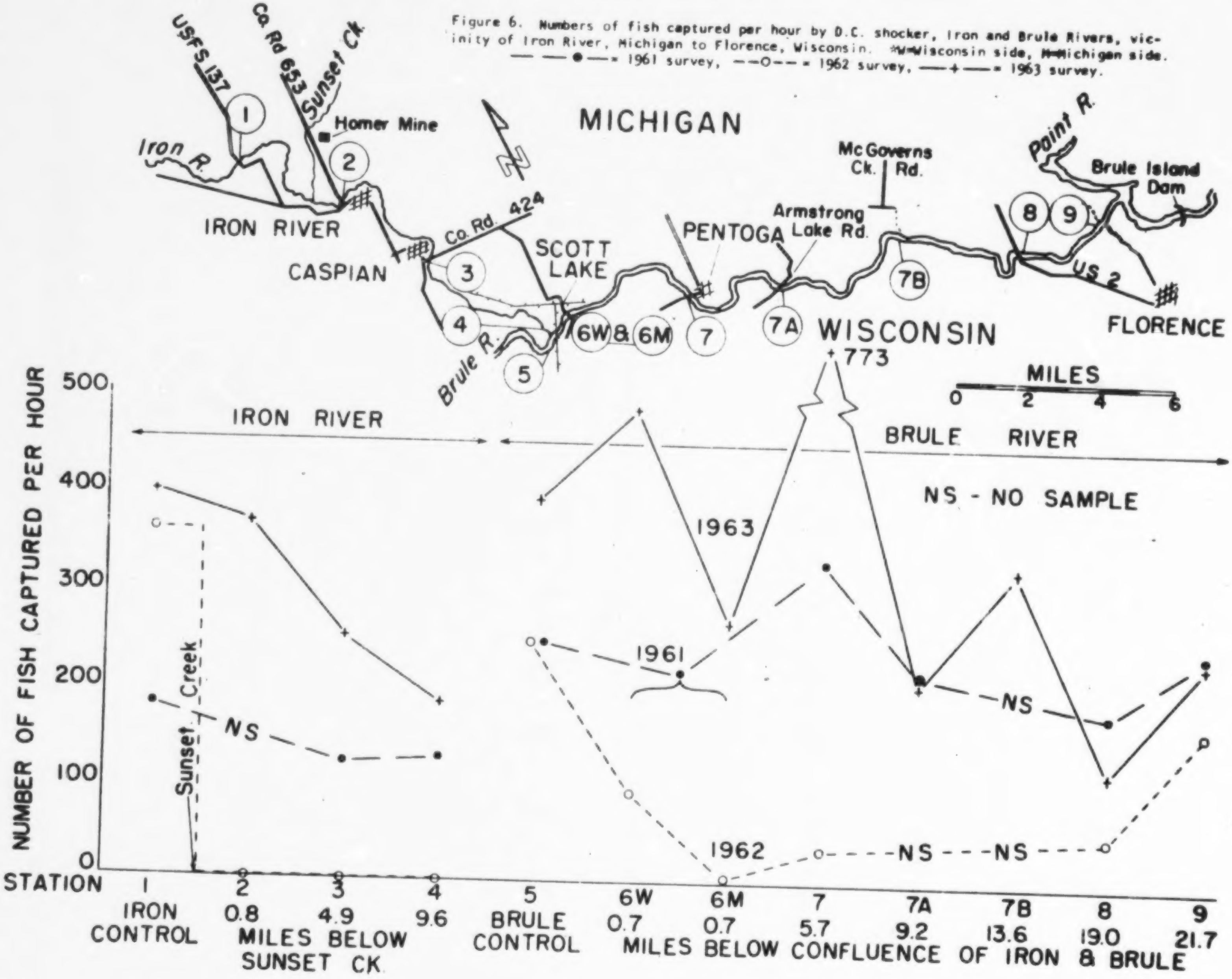


Figure 6. Numbers of fish captured per hour by D.C. shocker, Iron and Brule Rivers, vicinity of Iron River, Michigan to Florence, Wisconsin. W=Wisconsin side, M=Michigan side. — —●— = 1961 survey, ——O—— = 1962 survey, ——+—— = 1963 survey.

Figure 7. Number of fish of various species captured per hour by D.C. shocker, Iron and Brule Rivers, vicinity of Iron River, Michigan to Florence, Wisconsin. W = Wisconsin side, M = Michigan side. ——●—— = 1961 survey, ----○-- = 1962 survey, ——+—— = 1963 survey. NS = no sample

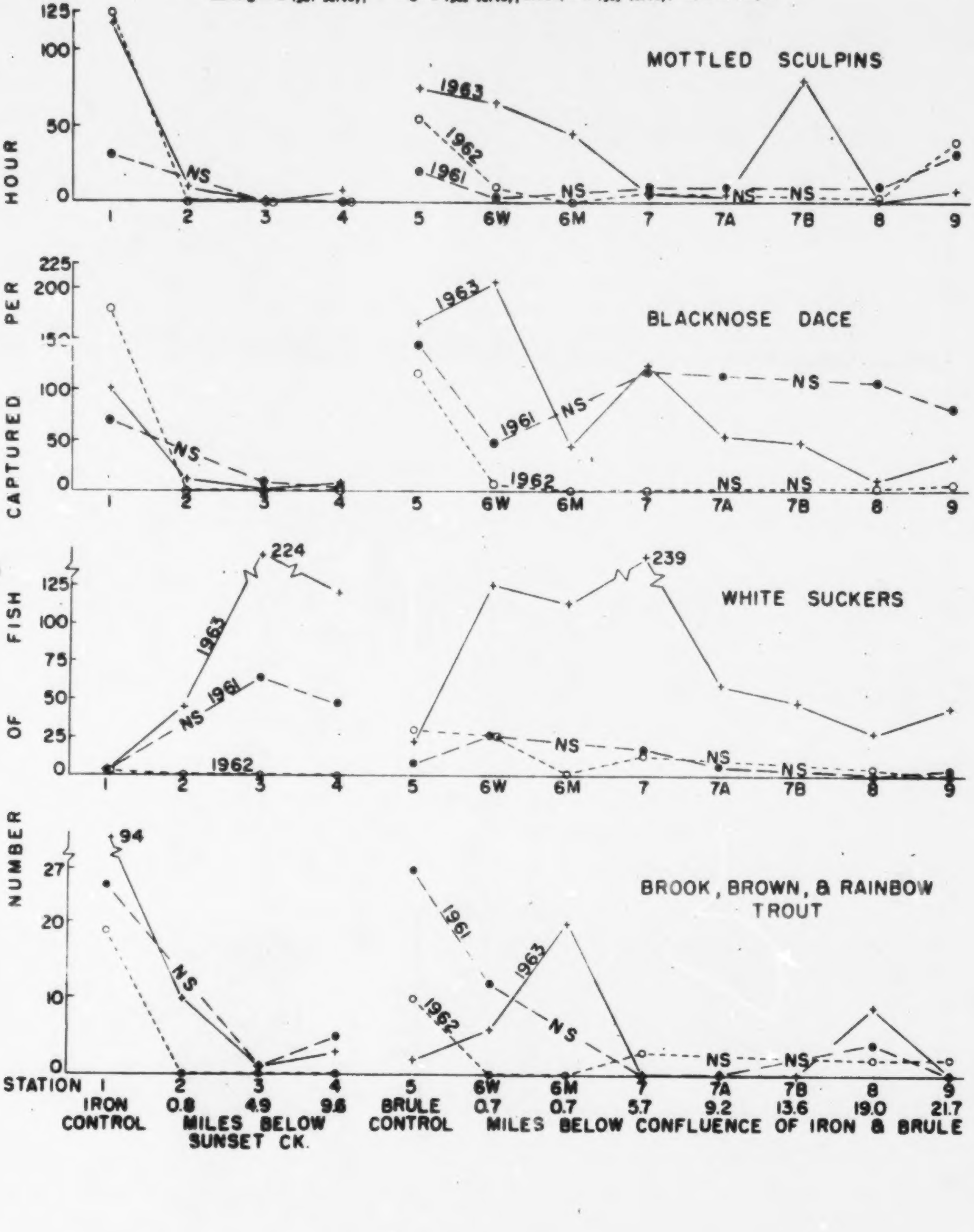
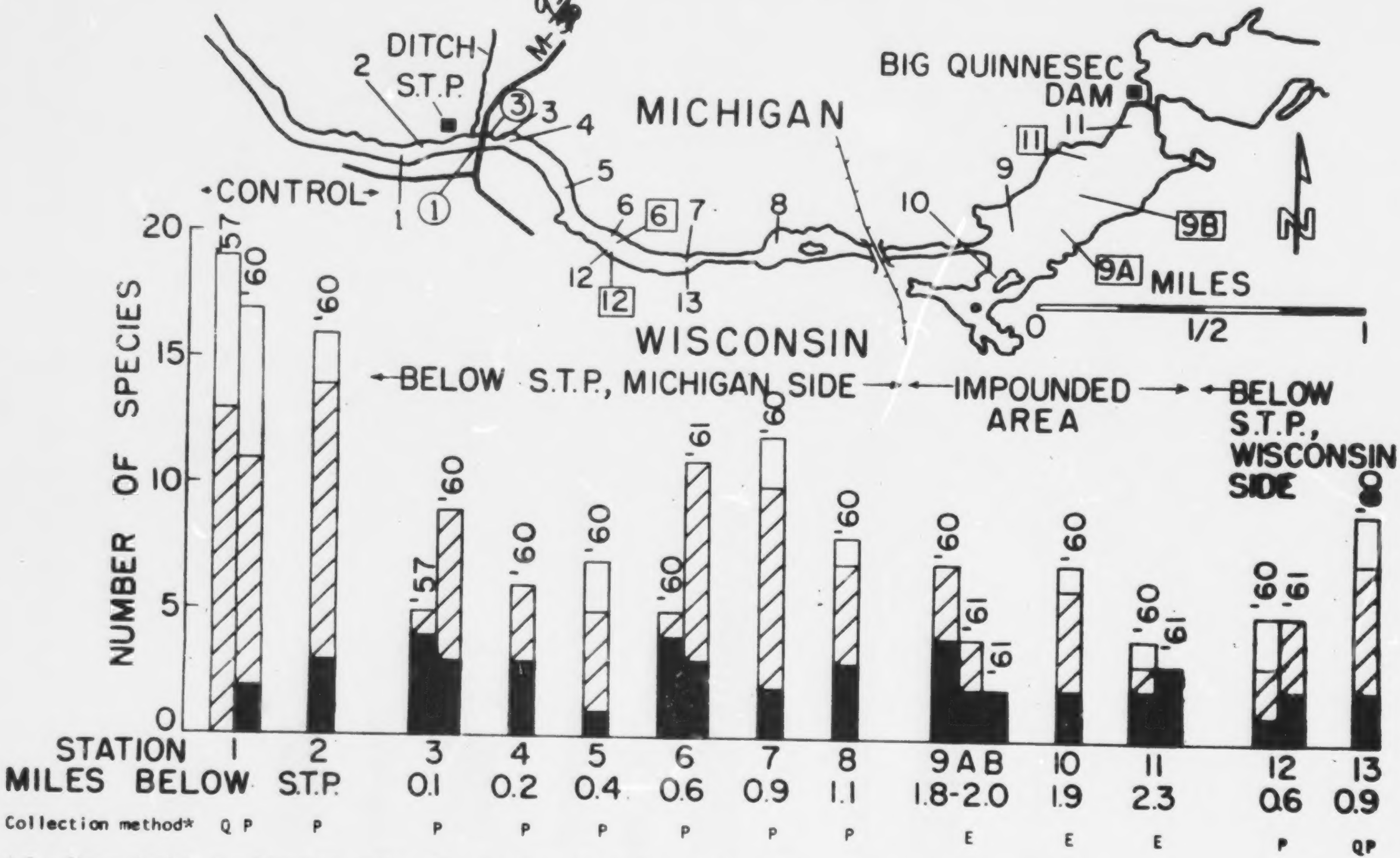
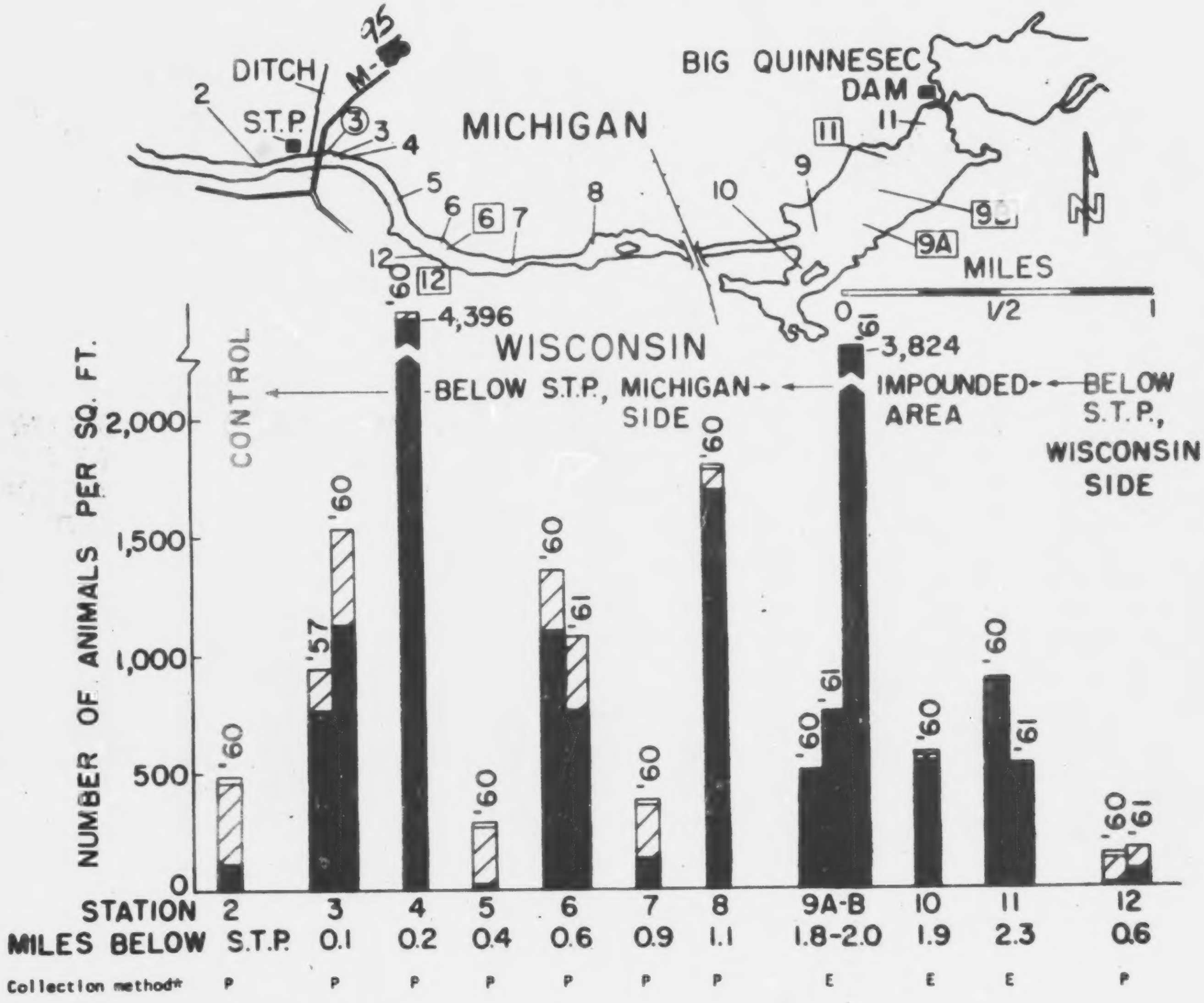


Figure 8. Menominee River, vicinity of Iron Mountain and Kingsford, Michigan, showing number of species and tolerance status of bottom-dwelling macro-invertebrates, Michigan Water Resources Commission biological surveys of 1957 (①), 1960 (1), and 1961 (▢). ■ = Tolerant ▨ = Facultative □ = Intolerant



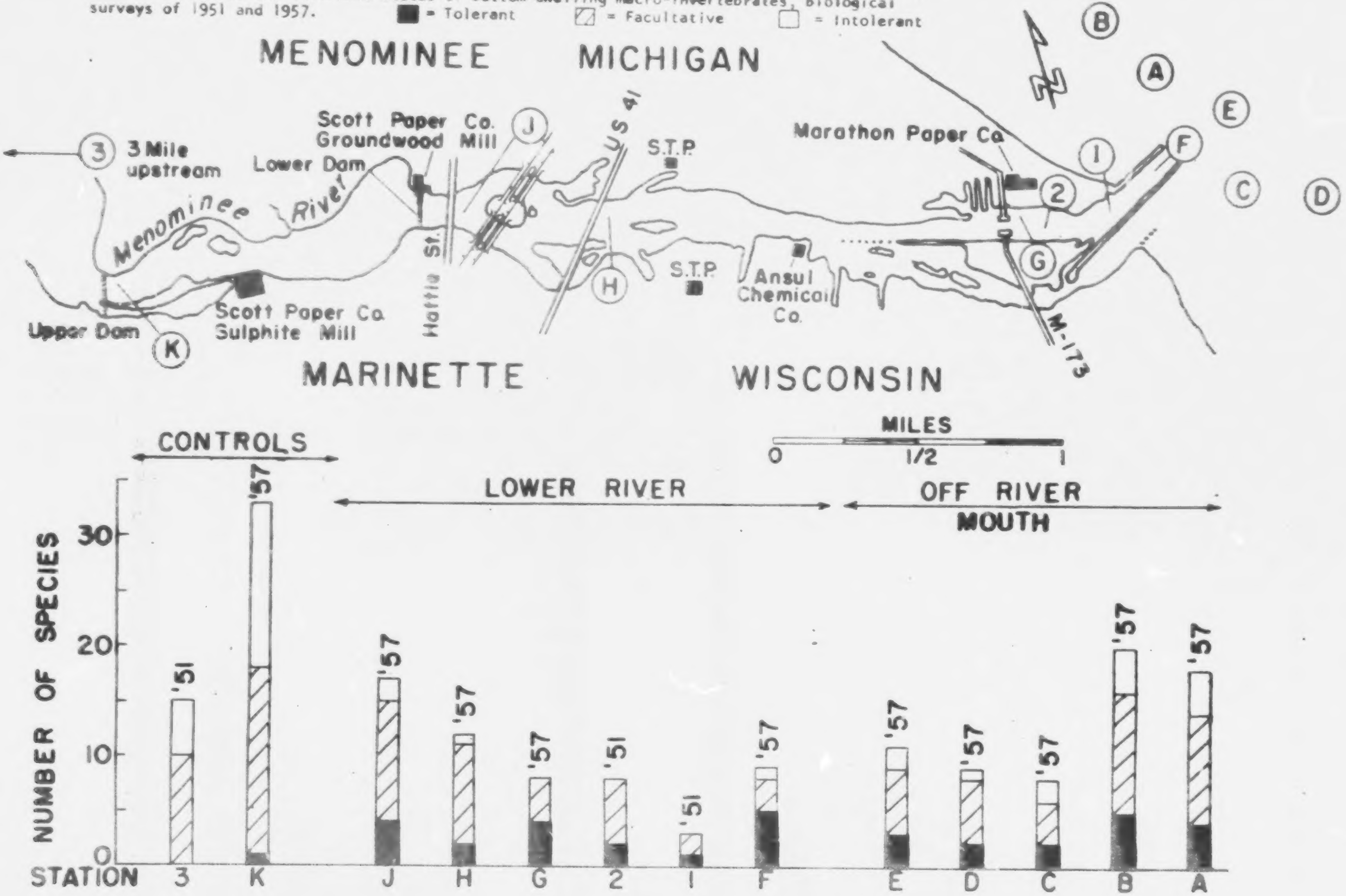
* E = Ekman dredge, P = Petersen dredge, QP = Qualitative by Petersen dredge

Figure 9. Menominee River, vicinity of Iron Mountain and Kingsford, Michigan showing number per square foot and tolerance status of bottom-dwelling macro-invertebrates, Michigan Water Resources Commission biological surveys of 1957 (③), 1960 (3), and 1961 (☐1). ■ = Tolerant ▨ = Facultative ☐ = Intolerant



* P = Petersen dredge, E = Ekman dredge

Figure 10. Menominee River, vicinity of Menominee, Michigan and Marinette, Wisconsin, showing number of species and tolerance status of bottom-dwelling macro-invertebrates, biological surveys of 1951 and 1957. ■ = Tolerant ▨ = Facultative ☐ = Intolerant



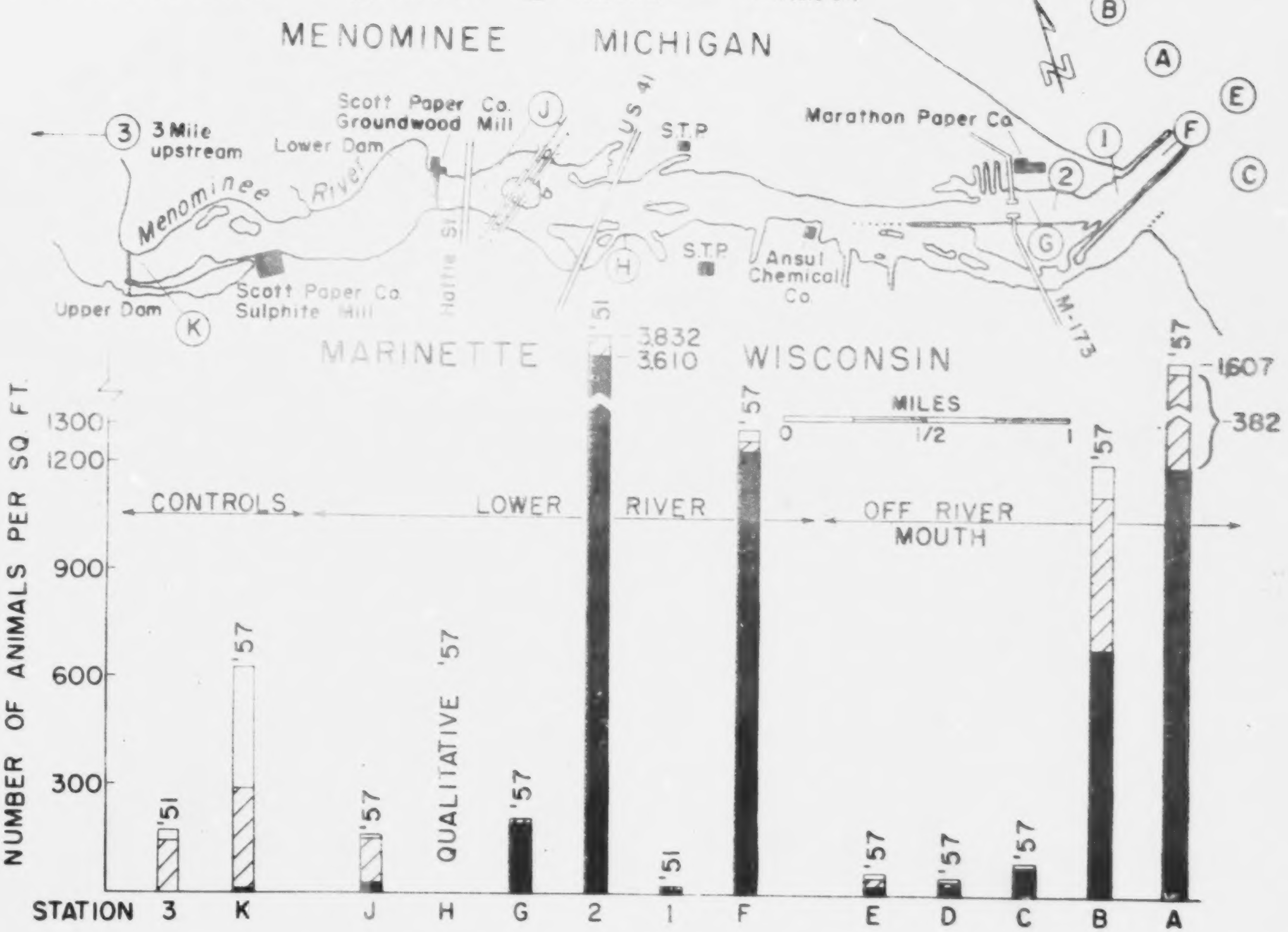


Figure 11. Menominee River, vicinity of Menominee, Michigan and Marinette, Wisconsin, showing number per square foot and tolerance status of bottom-dwelling macro-invertebrates, biological surveys of 1951 and 1957. ■ = Tolerant ▨ = Faculative ☐ = Intolerant

MR. OEMING: We have some slides that I think might be revealing to the conferees on the area, and the type of development on the stream, which will take a few minutes to run through. We would like permission to show them.

MR. STEIN: Are those slides available in the report?

MR. OEMING: No, sir, but we are prepared to have prints made, color prints made of the slides, and provide them to you.

MR. STEIN: Let me go off the record for a moment.

MR. OEMING: Yes.

(Discussion off the record.)

MR. OEMING: I neglected one thing, Mr. Stein.

Is it understood here that the report of the Health Department and Commission and the report that was presented yesterday by Mr. Marks are being made a part of the record, and will be in the transcript of this conference?

MR. STEIN: Yes.

MR. OEMING: I offer them anyway.

MR. STEIN: Yes, certainly, including your appendices.

MR. OEMING: Thank you.

MR. STEIN: I know this is a report of the Health Department and the Commission. Under our law, as you know, the official conferee for the State of Michigan is the Commission.

MR. OEMING: Yes.

MR. STEIN: I just wanted that to be very clearly understood, because our law is very clear on that.

MR. OEMING: Thank you.

MR. STEIN: All right.

MR. OEMING: Then it is presented by the Commission on behalf of --

MR. STEIN: You can present a joint report, but it is really the fact that it is the Commission's report.

MR. OEMING: Thank you.

MR. MUEGGE: May I make one comment?

We would like to say that except for a change in the designation of the agency, the statement that was just read by Mr. Oeming is consistent with the policy of the State of Wisconsin and the agencies controlling pollution.

MR. STEIN: Do you want to identify these slides with commentary, Mr. Purdy?

MR. PURDY: Yes, sir.

MR. STEIN: Yes.

FURTHER STATEMENT OF R. W. PURDY, CHIEF ENGINEER, MICHIGAN WATER RESOURCES COMMISSION

MR. PURDY: Slide No. 1 (indicating) is a picture of the land views in the Michigan portion of the Menominee River Basin. The green area designates forests or brushland as of 1955. The lighter areas indicate cleared land.

This (indicating) is an aerial photo of the Homer-Wauseca Mine Pond, seven ponds and mine lakes. This is Sunset Creek that runs through the middle portion of the picture.

MR. OEMING: Where is the pond, Ralph?

MR. PURDY: This is the pond (indicating).

This (indicating) is the discharge from the Hiawatha No. 2 mine outlet to the Iron River. You will note the type of development along the Iron River in this area.

This (indicating) is the Iron River at Caspian. Here again you will note the type of development along the river.

This (indicating) is the Brule River above the junction with the Iron River. I call your attention to the primarily forested area.

This (indicating) is the Brule River running from the left to right. This is the Iron River at its junction with the Brule. You will note the discoloration from the Iron River.

This (indicating) is the Menominee River at Iron Mountain-Kingsford. This is the Iron Mountain-Kingsford Sewage Treatment Plant. You will note the slightly discolored area of the river. This is the submerged outfall from the Iron Mountain-Kingsford Sewage Treatment Plant.

This (indicating) is Sewer Creek at Norway, looking from over Norway towards the Menominee River. Here again you will note the development. It is primarily forested land and brushland and farms.

This (indicating) is Sewer Creek as it joins the Menominee River. It is primarily a backwater area.

This (indicating) is the Menominee River at the Interstate Bridge west of Nathan in Menominee County, a farmland and forested area.

This (indicating) is the Menominee River at the Chalk Hill Dam in Menominee County. Here again you will note that this is primarily forested area.

This (indicating) is the Menominee River near Koss in Menominee County. No dwellings are evident in the picture.

R. W. Purdy

This (indicating) is the Menominee River now approaching the Menominee-Marinette area. You will note a few of the cottages that are now beginning to appear along the banks of the river.

This (indicating) is the Menominee River again in the Menominee-Marinette area. This is the backwater above the upper Scott Paper Company dam. You will note again the few dwellings along the banks of the river.

This (indicating) is the Menominee River in the Menominee-Marinette area, the Scott Paper Company on the Wisconsin side in the upper part of the picture. In the lower part, the Riverside Country Club on the Michigan side.

This (indicating) is the Menominee River again in the Menominee-Marinette area. This is the Ansul Chemical Company on the upper right-hand portion of the picture on the Wisconsin side, and in the middle portion of the picture on the Michigan side is the now closed plant of the Sugar Beet Company.

This (indicating) is the main channel of the Menominee River in the Menominee-Marinette area at the Sheridan Road bridge.

This (indicating) is the Lower Menominee River in the main channel. This is the Marathon Division of the American Can Company and its outlet to the river.

That is all the slides.

MR. STEIN: Are there any questions or comments on the slides?

(No response.)

MR. STEIN: Mr. Oeming?

MR. OEMING: We have completed our presentation.

MR. STEIN: I would suggest, before we get into the final portion of the discussion and summary, which we probably can combine, that we recess for ten minutes.

(Whereupon a recess was had.)

MR. STEIN: May we reconvene?

Before we get on with the summary and the discussion, I have a letter addressed to the Menominee River Pollution Committee, Goodfellowship Hall, Menominee, Michigan, from D. V. Tatro of Wallace, Michigan, Route 2, Box 61. This letter is dated October 17, 1963. The body of the letter does not identify the river she is talking about, but it appears to complain about pollution.

Without objection, I think we should put this in the record, since we put in all the material that has come before the conferees.

(The letter referred to is as follows:

"Oct. 17, 1963

"Stench from River would gag you.

Couldn't have windows open. The River has dead logs and Bars and the weeds are rotting on top of the sand Bars and the Dams still hold the water back and the low water smells worse then our Septic tank; this year the bass was wormy and soft as mush, even the sucker when you hpok them and grab them by the back of the head to remove hook the head would almost drop off the fish they were that soft and now on top of it we have lampreys in the river caught one on a hook over a foot long. All summer the grass floated down the river and the scum on the water was as thick as oil.

"Dorothy V. Tatro
Wallace, Michigan
Route 2, Box 61"

MR. WISNIEWSKI: Mr. Chairman, I would like to know where Wallace, Michigan, is.

MR. OEMING: It is on the map.

MR. WISNIEWSKI: It is in the lower portion of the Menominee River. About how many miles is that from the river?

MR. BAL: It is roughly about three miles to the river.

Closing Statement - Mr. Stein

MR. STEIN: Thank you, Mr. Bal.

At this point, we are required by law to try to get a summary of the conference, and based on what is said here, I think we should be able to try to determine where the Federal conferees and the State conferees have areas of agreement and disagreement, if there are any, and that can be noted.

The purpose here is not, as indicated by the statute, to make a determination, but just to come up with a summary.

It should be pointed out here too that at the conclusion of the conference, or after the conference, the Secretary of Health, Education, and Welfare may make recommendations to the official State agencies concerning any remedial action which he believes to be in order.

Generally speaking, where conferees have agreed upon remedial action or a program, the Secretary has adopted that and sent that out. I said, "generally speaking." He has done that invariably where the conferees have agreed on remedial action.

While conferees may come to areas of possible disagreement as to the facts in a particular area, I think agreement can be reached on a program for future action.

I would like to say one thing before we begin the summary. I think we will note in the summary that all the conclusions of the conferees, or conclusions and recommendations of any of the conferees, are both subject to the reservation made by Mr. Olds for the Attorney General of Michigan and the legal objection going to the constitutionality of the law made by Mr. McDermott.

The report of the Department of Health, Education, and Welfare indicated that organic pollution discharged to the Upper Menominee River reduced the oxygen content of the river below the level considered critical for fish life; that solids pollution, which included wood chips and fibers, bacterial slimes, floating scum and septic sludge, degraded the appearance of the river and reduced its esthetic appeal for general recreational use; and that solids settled to form sludge deposits, which prevent the use of this area for fish spawning, and decrease the population of pollution-sensitive fish food organismsfor some 22 miles below Niagara, Wisconsin.

The Department report indicated that at the present time the Kimberly-Clark pulp and paper mill in Niagara, Wisconsin, is the principal source of organic and solids pollution.

The representative from the Kimberly-Clark organization, Mr. Richard Billings, indicated a proposed plan of plant rebuilding, with consequent different pollution control problems and measures to be taken which would affect the stream.

As always, I think the Kimberly-Clark Company has been very cognizant of these problems, and, whenever we have seen them, have made a consistent effort to analyze the situation factually and come up with a reasonable solution satisfactory to regulatory authorities.

In this case, I think there was an indication that the results might provide a minimum of four parts per million of dissolved oxygen during the spawning season, and an average of five, and that an attempt would certainly be made to keep a minimum of three parts per million of dissolved oxygen during the rest of the year.

I think this, from the Federal point of view, is a perfectly satisfactory program, that if the four and five parts per million are maintained during the spawning season, that would be satisfactory, but that an evaluation should be made of what is happening during the rest of the year, and if the dissolved oxygen significantly and consistently falls below three parts per million, then the situation would have to be reevaluated.

The Department of Health, Education, and Welfare report also indicates that bacterial pollution of the river above a level considered satisfactory for general recreational use is occurring in the Upper Menominee River, and waste from Niagara, Wisconsin, effluent from the Niagara, Wisconsin, sewage treatment plant, and untreated sewage from Norway, Michigan, are principal sources of this pollution.

The recommendation, of course, that the Federal conferees would make is that the water pollution control agencies of Wisconsin and Michigan take effective and appropriate action, as they demonstrated they can and have taken under law, to get this pollution cleaned up within a relatively short time.

The next thing that the Department of Health, Education, and Welfare report shows is that there is evidence of degradation by sludge deposits of the Upper Menominee River.

I think that there is a question here of whether the sludge deposits should just be allowed to disintegrate by themselves, if they are not being added to, or whether a program for eliminating the sludge deposits should be undertaken.

I don't know, unless Mr. Schneider has some comment, that we have any suggested program for removing the sludge deposits.

Do you, Mr. Schneider?

MR. SCHNEIDER: I wouldn't know of any.

The only program of assistance that we have in that respect is the construction program, and this does not look like a municipal type of project.

MR. STEIN: By the way, I don't know whether this can be done or if this is worth considering, but, at any rate, as both States know, our Department is available for technical assistance. I don't know whether the Corps of Engineers representative is in the room, but, as you know, we are not a construction agency in our Department, and we regard the Corps of Engineers as the Federal construction agency for any work we are interested in.

By and large, though, the Corps of Engineers has been a construction agency for navigation and flood control. There have just been a few tentative approaches, where the Corps has gone into construction for water quality control, where this involves a public works project.

However, any work of this kind would have to be specifically authorized by the panel, and I think removal of sludge banks, which appear rather frequently, might not be appropriate for that kind of operation.

This would summarize the Department of Health, Education, and Welfare position, at least from its report, on the Upper Menominee River.

May we have a comment from the State of Wisconsin as to their views on this? Where you coincide, this will be noted; where you differ in the summary, your views will be noted.

MR. WISNIEWSKI: The Federal report fails to recognize the fact that there is an outstanding order against Kimberly-Clark Corporation at Niagara, which requires the submission of a report to the Wisconsin Committee on Water Pollution on or before July 1, 1964.

MR. STEIN: I think we can include that in the summary, which we both can agree on. That was an oversight.

I might point out one thing more. These rivers I think are interstate rivers within the meaning of the Federal Act.

MR. MUEGGE: But not navigable commercially.

MR. STEIN: The Act does not say "navigable commercially." I said they were interstate. They could be interstate or navigable. This is what the law is.

I know there is a lot of resistance to the concept in the Federal statutes of what "navigable" means. However, again may I suggest I am not deprecating your point of view at all, Mr. Muegge. I suggest this is really not the forum for it. While I may sympathize with this, the definition has been given to us.

MR. WISNIEWSKI: I still make the point that you have failed to recognize the existence of a Wisconsin order against the Kimberly-Clark Corporation at Niagara, and that this order requires a report by July 1, 1964, on plans for reduction of pollution.

This order would be subject to such further orders as may be issued following the receipt of these plans. That decision will be made by the Wisconsin Committee on Water Pollution.

MR. STEIN: I thought the report covered that, Mr. Wisniewski.

MR. WISNIEWSKI: It does not, except for our portion of it. You made no comment on it in your conclusions.

MR. STEIN: I think the record speaks for itself, but we can go on.

MR. WISNIEWSKI: Then this will give it added emphasis.

With reference to the village of Niagara, there is also an outstanding order requiring correction of the situation by July 1, 1964, and this is subject to enforcement by the Wisconsin Committee on Water Pollution and the State Board of Health.

MR. MUEGGE: A lot of discussion has been held with regard to the Wisconsin statement. I don't know that you want to go into great detail, but we have need for esthetic, clean streams, and I think we favor them and desire to have them.

However, I think the nature of the terrain and the nature of the river must be given consideration.

MR. STEIN: I would agree with that.

By the way, I would like to make one more point. With regard to the program for abatement by Kimberly-Clark -- and I am pretty sure this is included as part of the Federal recommendations, at least -- this should include the elimination of wood chips and fibers to the extent where it will not interfere with water uses downstream.

MR. WISNIEWSKI: Our findings were that the company provides adequate facilities to reduce woodroom and fiber losses to a practicable minimum, and these are findings in the order which I showed you before.

MR. MUEGGE: You meant control, didn't you?

MR. WISNIEWSKI: The company provides adequate facilities to reduce woodroom and fiber losses to a practicable minimum.

This is a finding of the Wisconsin Committee on Water Pollution.

MR. STEIN: Are there any further comments from Wisconsin?

(No response.)

MR. STEIN: May we ask Michigan for their comments on the Upper Menominee?

MR. OEMING: I have a couple of comments, Mr. Chairman, and I think perhaps Mr. Pierce may also have something on the points you have made here.

First of all, with reference to Norway, as the record has indicated, an order had been issued at one time, and when it came to the point of enforcement, the Commission felt that it did not have sufficient evidence at hand and was not able to get any to enforce the order.

Now, the question has been raised here as to the effect upon the Menominee River from the discharges of Norway to Sewer Creek.

We, of course, are committed, first of all, to the Committee on Water Pollution, to take any measures in Michigan which will affect the Menominee River. That is their interest and our interest as well. The record also, during this past conference, indicates that the State is keeping surveillance of this matter.

Now, I would suggest this: That the State, first of all, make a further detailed study of this problem of the effect upon the Menominee River, with a view of determining whether, under the Michigan statute, enforcement proceedings can be undertaken.

I would think, Mr. Stein, that they should be started anew rather than rely on the original order. So much time has elapsed.

I would also say this to you: That if the State can find a violation of the Michigan statutes which will support an action, that this kind of action would be taken either by the Water Resources Commission or by the State Health Commissioner, whichever felt it appropriate. Either way would be effective.

So that my suggestion to you is that the State of Michigan make a reevaluation of this, a thorough evaluation, and that it submit to you a report on whether or not it is in a position to initiate enforcement action based upon the effects upon the Menominee River. This would also apply, of course, to Michigan, but I mean insofar as your interest is concerned here.

MR. STEIN: Speaking for myself, I think that would be perfectly satisfactory.

MR. OEMING: The only question here in my mind is when would you like such a report? This has always been a marginal problem here.

MR. STEIN: Yes.

MR. OEMING: And I would think that you might have to have a summertime period to do this. I don't believe it is significant in the wintertime.

MR. STEIN: Right.

Now, here I would like to make one point, and, of course, this is up to Michigan. We recognize there are other problems in Michigan. We do not want you to disrupt your general activities.

If you wish, at your request, we are prepared to assist in this, and I think we could, financially or otherwise. You may not want us to do that.

As a matter of fact, you don't have to decide that now, and I recognize the implications here, but this is not meant to imply that we would do the report. We would be perfectly happy for you to do the study and present the conclusions, but I would think that next summer would be an appropriate time.

MR. OEMING: Mr. Chairman, let me point out that in your report you have given us some basis already.

Now, I think that the State, through its Health Department and the Commission's staff, certainly can give this a high priority, to do this work during the next summer period, and I am sure that we would. If this is the conclusion of the conferees, there is no problem of getting this work done.

MR. STEIN: How soon after that is done would the report normally be issued?

MR. OEMING: The report would come out in a couple of months.

Is this enough on Norway for a moment?

MR. STEIN: Yes.

MR. OEMING: I will turn it back to Mr. Pierce in just a moment, but I have another comment.

MR. STEIN: Yes.

MR. OEMING: In the upper river you pointed out that there is degradation due to the sludge deposits.

Are you referring now to the Brule itself or are you referring to -- I am not sure which sludge deposits you are referring to. Are you talking about the cementing of the river bottom?

MR. STEIN: No, I am not.

MR. OEMING: Apparently then, in the upper river, I don't recall that this involves Michigan, does it?

MR. STEIN: No.

MR. OEMING: I don't think so.

MR. STEIN: As a matter of fact, I just referred to that in the report in case anything came up.

As I see it, we have no specific recommendation on that. We have been living when sludge deposits are there, and if pollution is stopped we are not adding to their accretion. The normal thing to do is wait for the spring washout and let them go away.

The reason I brought this up was that if you people thought there should be anything more done to get those sludge deposits out of the way before they dissolve, this would present an opportunity.

MR. OEMING: I don't believe so, Mr. Chairman. At this time I think, with the picture that has been presented to us, plus what we know has occurred in the past, that this problem should diminish both naturally and artificially.

MR. STEIN: Yes.

MR. OEMING: With that, I will give Mr. Pierce a chance to take it.

MR. PIERCE: Just a couple of additional aspects of this Norway problem to supplement what Mr. Oeming has said.

It was mentioned, I believe, during the conference, that we, of the State agencies, have been keeping the Norway problem under close surveillance continuously over a number of years, and we are continuing to do this.

Recently, during the last couple of years, there has been considerable interest expressed by the Norway official family to undertake this project voluntarily. We have promoted this and will continue to promote this, and there certainly is some possibility that Norway may undertake this project without any enforcement procedures, should enforcement procedures be indicated. At the moment we do not have information, of course, as Mr. Oeming has said, which indicates that enforcement procedures are indicated.

As was mentioned earlier in the conference discussions, we were interested in knowing whether the raw data collected by the Department of Health, Education, and Welfare during this survey might be available to our agencies; and in this particular case I should like to make a request now that the raw data having any bearing on the Norway case be reproduced or otherwise made available to our staff, so that we may have the benefit of this information also.

MR. STEIN: Yes.

Let me check before we are off that. How soon can that be done?

MR. WEST: It will be in the mail Monday.

MR. PIERCE: Just one note on this: Insofar as the capability of the Michigan agencies to conduct this survey and evaluation without unduly unbalancing the remainder of our efforts, I am sure this could be done.

MR. STEIN: Thank you.

MR. PIERCE: Mr. Ronk, do you care to say something?

MR. RONK: No.

MR. STEIN: I would like to get one thing for this portion of the summary, if we possibly can, from Wisconsin. That is the date that was indicated here that the Kimberly-Clark mill would begin their turnover, and when they would be in operation.

MR. WISNIEWSKI: I should like to point out to you that in the order this calls for submission of plans and their proposal by July 1, 1964, with this provision in the order being subject to such further orders as may be issued following receipt of plans.

A decision on date cannot be made until we receive the actual plans and proposals, on the basis of which we can determine how long it will take to make the change-over.

MR. MUEGGE: Mr. Billings gave us some date on that.

MR. STEIN: He gave us some date on that.

MR. MC DERMOTT: Mr. Billings is out in the audience.

MR. STEIN: Mr. Billings, would you care to comment on that now? This is just a repetition of the figures you gave yesterday on your proposed change-over, and just the dates that you intended to do that.

MR. BILLINGS: The plans I do not have.

MR. GEMING: Why don't you ask Mr. Billings to come up here?

MR. STEIN: He is looking for his papers. I think we can use an approximate date, Mr. Billings, and not a specific one, if you can.

MR. BILLINGS: I have here an announcement from the mill manager.

MR. STEIN: Would you want to come up? I think they are having difficulty hearing you.

MR. BILLINGS: I have an announcement from the mill manager as to the date of the sulfite pulp mill shutdown schedule.

As most of you already know, it will be necessary to discontinue our sulfite pulping operations in 1964. This department is being shut down for the following reasons:

The process is obsolete by comparison to modern methods of pulping manufacture, and therefore can no longer be operated on an economic or competitive basis. The existing facility does not lend itself to modernization. Quality demands imposed by our customers require the manufacture of different pulps.

State and Federal authorities are interested in the pollution and -- this is a very blank copy and I can't see the words. Let me try that again -- and State authorities are requiring a reduction in the amount of stream pollution resulting from the discharge of spent sulfite liquor in the Menominee River.

Some of the present sulfite equipment will be used in the new high yield mill, which is scheduled to start up in the fall of 1964. This equipment will be moved from its present location beginning in May, 1964.

I think that is the point that you wanted.

MR. STEIN: That is the point. Thank you very much, Mr. Billings.

I think from the point of view of the Federal people, at least, these dates are satisfactory. As far as pollutional effects of the mill, obviously they are going to be zero when the mill is closed.

The only issue is going to be when the new mill is opened, in compliance with the Wisconsin order, that these requirements will be met, and I am sure this will be done.

Yes, Mr. McDermott.

MR. MC DERMOTT: Mr. Chairman, there is one more time element here, while Mr. Billings is here.

MR. STEIN: Yes.

MR. MC DERMOTT: Didn't you tell us yesterday, Mr. Billings, that sometime early in 1964, presumably within several months, three or four months, we could get an appraisal from your company as to what the D.O. would be in this new process, that is involved in this new process in the season outside of the spawning season?

MR. BILLINGS: Yes, very definitely. We will try and, of course, have that for you well in advance of the deadline date. As you well know, it has been our practice to try to beat your deadline.

MR. MC DERMOTT: Thank you.

MR. STEIN: Now let us get to the Lower Menominee River.

The Department of Health, Education, and Welfare report concludes that we have pollution in the Lower Menominee River for a distance of three miles below the Scott Paper Company at Marinette, Wisconsin, to its mouth by wood chips and fibers, slime bacteria, and the elimination of bottom organisms. This pollution adversely affects the physical appearance of the river and reduces its esthetic appeal for general recreational use. The Scott Pulp and Paper Mills in Marinette, Wisconsin, and Menominee, Michigan, are principal sources of pollution above the Marathon Paper

Company. Solids from the Marathon Paper Company contribute to pollution at the mouth of the river, and they consider that bacterial pollution of the river from coliforms is somewhat higher than the level considered satisfactory for general recreational use. Effluent from the Marinette, Wisconsin, sewage treatment plant is the principal source of bacterial contamination in the Lower Menominee River.

For the Federal Government, we would suggest that the States of Michigan and Wisconsin, in dealing with the industrial sources mentioned here, adopt commensurate programs to outline in terms of the time schedule and results to be achieved by the Kimberly-Clark Company, both in terms of wood chip and fiber removal, and in terms of B.O.D., which very well may exist at the present time from these mills.

I do think, having heard from representatives of Marinette, Wisconsin, that they have indicated a plan, unless extra funds are forthcoming, of a separation of storm water and sanitary sewers over the next ten-year period, which they would be very happy to accelerate if grant funds or funds from other sources become available.

I think this is a very good program, but I would suggest that it might be worthwhile for Wisconsin again, and for Marinette, Wisconsin, to evaluate the situation of not doing anything about improving their sewage effluent from their plant until they have gotten along or finished their storm water program. This may be well worth looking at again, since this may well be a ten-year program.

Mr. Billings, do you have anything to say?

MR. BILLINGS: Something that you said, Mr. Stein, right there, I thought would be very important to call its attention again to the record of the conference.

Do not put wood chips and fibers in the same classification. Wood chips, as I said in my testimony, we have installed the equipment and they occur now only when there is some accident, or something like that.

MR. STEIN: Yes.

MR. BILLINGS: Wood fibers, on the other hand, have to be reduced in small chunks, and as long as we are making paper we will not be able to eliminate them completely. This is within the ten-yard line that I was talking about, and I just wanted to make sure you understood that.

MR. STEIN: Yes. By the way, I think that comment is very much appreciated. I did not mean, in lumping those, to indicate that the control measures or what we are going to do about wood chips and fibers were the same.

MR. BILLINGS: All right.

MR. STEIN: We recognize that in many cases in the mills these days, you are getting a lot of peeled wood and cutting it down, and these are continuing programs.

I think the formulation given by Mr. Wisniewski was the one to have these reduced to the maximum practicable limits, which is the one that we are all looking for. Thank you.

Mr. Muegge?

MR. MUEGGE: I would like to comment in regard to the sewage treatment plant.

In the program again of the Committee on Water Pollution and the State Board of Health, our observations of these plants are continuous, and we have a continuing program for pollution abatement throughout the State.

Should any data come to us that shows that there is a need for improvement, it will be immediately acted upon, and we will act upon the situation in the case of Marinette.

I am not sure, but I feel that perhaps the cause of the coliforms is due to inadequate or improper control of the disinfection facilities, and we will readily check that out.

I am not in full accord with the statement that this value of 5,000 coliform per 100 milliliter is the proper one for use for waters that are used for recreational purposes. We have people that have used waters much higher than that from a coliform standpoint, and there has been no indication of illness resulting from such usage.

Therefore, I think that that matter should not be stressed as being a consensus of opinion of the conferees.

MR. STEIN: This will be so indicated in the summary.

Are there any comments from Michigan on the Lower Menominee?

MR. OEMING: Yes, sir.

You have mentioned here specifically the Scott Paper Company's mill on the Michigan side.

I wish to point out to the Chairman and the conferees that a comprehensive study was made prior to the calling of this conference in July of 1963.

Now, while the summary presented in our report does not so state, the conclusion was that with respect to bark and slivers, by the nature of this operation, there was a problem. This was under adequate control.

But, insofar as the loss of suspended solids and fiber, it was considered that this was excessive. It was more than we want to see, and a letter has been written to the Scott Paper Company informing them of this conclusion, and requesting them to submit to us a program for reduction of these losses to bring them more into line with what is considered fairly accepeable practice in the paper industry.

A response has not yet been received. The letter went out, I think, last month, so at this time I would be unable to say that a program commensurate, as you have stated, with the Kimberly-Clark program, would come out of this; but in any event, I think that we could notify you as to what the outcome of our negotiations are with the mill on this on an informal basis at this time.

This has not been brought to the Commission, and it would not be until we feel we and the company are in agreement on a level.

MR. STEIN: We would appreciate that. Do you have any idea about the time this takes normally?

MR. OEMING: The time it takes to get --

MR. STEIN: For a reply and to negotiate?

MR. OEMING: I would think that if we don't get a reply within a month, we would be unhappy.

MR. STEIN: All right. Thank you.

By the way, Mr. Oeming, do you have any more, because if you haven't, I am afraid we moved over to Michigan too quickly. I think Wisconsin still has some remarks.

MR. OEMING: I am sorry.

MR. STEIN: I did that.

MR. OEMING: I'm sorry.

MR. STEIN: Mr. Wisniewski?

MR. WISNIEWSKI: Mr. Chairman, I understood you to say that you were expecting the Scott Paper Company would get the same deadline as Kimberly-Clark Corporation?

MR. STEIN: No, sir, I did not say that -- absolutely not. I hope I made that clear.

MR. WISNIEWSKI: Will you please repeat?

MR. STEIN: I said a commensurate program, which means taking the Kimberly-Clark program into account and doing this on a matter of equity, that the same kind of treatment be afforded to the Scott Paper Company since they are both in the same area, in the same riverbed.

MR. WISNIEWSKI: Well, actually, here again we have an order issued to the Scott Paper Company. I will read you the findings:

> "1. That the Scott Paper Company, Marinette, manufacturer of pulp and paper, utilizes the method of hauling spent sulfite liquor for use as road binder as a means of reducing the amount of pollutional waste discharged to the Menominee River.
>
> "2. That the remainder of the spent sulfite liquor discharged to said stream causes a lowering of dissolved oxygen and development

"of slime growths which give rise to objectionable conditions and constitute stream pollution.

"3. That said company provides efficient savealls to reduce discharge of fiber to a practicable minimum."

We drew the conclusion that the order made for reduction of pollution of the Menominee River by wastes from the Scott Paper Company at Marinette is reasonable and proper and necessary for the protection of public rights in said stream.

We then required the Scott Paper Company to submit plans for reduction of pollution at Marinette to the Committee on Water Pollution by July 1, 1964, with this provision being subject to further order as may follow the submission of the plans.

This type of order would depend entirely on the type of plans submitted. A more complicated plant takes more than a simple plant.

MR. STEIN: Certainly, from our point of view we can all subscribe to that. These are the facts of life in this business. You don't build a complicated plant taking two years to build in three months.

MR. METZGER: I might add that we will anticipate that any chips or bark or anything in appreciable quantities will also be controlled.

MR. STEIN: Thank you, Mr. Muegge.

Is there anything further from Wisconsin?

MR. WISNIEWSKI: No.

MR. STEIN: May we go back to Michigan now? Mr. Oeming?

MR. OEMING: In this section of the river, I believe it would include the Marathon mill too?

MR. STEIN: Yes, sir.

MR. OEMING: All right, sir.

In the case of the Marathon mill, as you know, we have submitted to you a series of studies made over the years, and here again, as with the Scott Paper Company ground wood mill, we did not consider the loss of suspended solids as satisfactory. We think it should be reduced. In this respect, we would agree with your report so far as creating sludge deposits.

In this case, in the case of this mill, this is not the kind of mill that has bark and chip problems. This is a fiber problem, and we have requested the company to make daily tests of their effluent and to evaluate what they can do with the present equipment and whether this is going to be adequate to cut these losses down. We haven't set a limit yet, but the company has agreed to make these tests, these daily tests, of their effluent, and I would think that within a period of five to six months we should reach some conclusion on whether the company needs something more, or whether they can operate this equipment to obtain a substantial reduction.

Now, I would add this further: That our Mr. Purdy, our Chief Engineer, has a conference scheduled with the company within -- as soon as he can get to it, and this won't be very long. This will be in a couple of weeks, I hope, unless we have another Federal conference.

(Laughter.)

This is in substance where this stands now, for a determination of just how far we are going to go with this, but certainly we are in agreement that this is too high, and I think the company also agrees with us. The question is, what can we do about it, and this all leads up to a program.

So, here again, we would be very happy to provide you, as Chairman, or anyone you wish, with the findings and the results of this. We would be very happy to provide that.

MR. STEIN: Yes. I think all this should be provided to me.

MR. OEMING: Yes, sir.

MR. STEIN: As you know, just for the record, we will give this to our technical people.

MR. OEMING: That is fine. We have no problem with that.

MR. STEIN: Are there any further comments from Michigan?

MR. PIERCE: No.

MR. STEIN: If not, let's go to the Brule River, and here the report of the Department of Health, Education, and Welfare says that bacterial pollution in the Brule River, which contains treated sewage from the neighboring communities of Iron River, Stambaugh, Caspian and Gaastra, Michigan, increased the total coliform density above the level considered satisfactory for general recreational use for a distance of more than five miles, and most probably eight miles, below the mouth of the Iron River.

The report also says, and you may want to have some comment on this, that for approximately 14 miles, gravel areas on the bottom of the river are cemented together with iron deposits, which drastically reduce desirable fish food organisms and interfere with fish spawning. Although much of the damage was done by gross iron pollution, which was discontinued in 1963, further investigations will be needed to determine whether or not the present iron mine drainage continues to degrade the river bottom.

Now, to get back to the two issues, and I think we will call on Michigan first at this time, since this seems to be largely a Michigan program. Maybe we can take the relatively easy one first, the statement that the gravel areas are cemented together with iron deposits for approximately 14 miles.

Either you agree that they are cemented together or not. If they are not and they are disintegrating, fine. If they are, then we have another situation, whether discharge is still contributing to that cementing. If it is, of course it should be controlled or stopped.

However, and this is what the report seems to indicate, if these are substantially stopped and the cementing continues, does any kind of a program have to be instituted to get rid of this cementing?

MR. OEMING: Are you ready for me?

MR. STEIN: Yes. Let's take that.

MR. OEMING: Well, Chairman Stein, I think we take exception to one part of this statement, and that is that there is a drastic reduction of desirable fish food organisms, and that there is interference with fish spawning.

I believe that our study, which was quite a bit more intensive and long-termed than the studies made by the Federal people, would tend to change this conclusion. At least, it does in my mind.

Now, I am not saying that there is not cementing in the river. I am just going into the finding here as to the effect on the fish food and the spawning.

MR. STEIN: Yes. May I comment on that?

I think this is really one of the few places where we may come to a difference between both staffs on physical facts, which is something that should be measurable; but I suggest that at the convenience of our technical staff, which would largely be the biologist, and your staff, that these people make arrangements to get together and try to see if they can't get together on a factual statement and prepare a joint statement for submission to all of us on this.

Would this be agreeable?

MR. OEMING: This is fine with us. This is the kind of thing we like to see.

MR. STEIN: Because I don't think that this is something where there should be a bit of disagreement on what the physical conditions are in the river.

MR. OEMING: I think that is right. I would like to see them resolve this question.

MR. STEIN: Right.

MR. OEMING: Now, as to the cementing problem, we don't question the fact that there is cementing in that river bottom. This is obvious from both our studies here.

The problem of whether this is going to reduce naturally or require some artificial means, I don't think we can answer today. I do feel that with the record that was cited by Mr. Fetterolf of the study that has been made over the years, that there is a little weight on the side that this is going to change by itself.

I want to emphasize that there was a very severe shock on this river in 1962. There isn't any question about it. This was a very severe shock on this river, and I am not satisfied with the results of a determination made within, let's say, six or seven months after this stopped, that this is going to lead to any conclusion.

If we have to do something artificially, this is going to be quite a sizable operation, and I think that time will have to be allowed here to make some determination, and probably through the next flush season of the river we may be able to get a better picture of what is happening. We have some pretty good background now.

MR. STEIN: I thoroughly agree with you, Mr. Oeming, and I might say for the technical staff that is going to look into this, if you do anything artificially, I think the way this is developed, unless the States have changed very much, is that there would probably have to be a Federal authorization.

To do something like this would be no small undertaking.

MR. OEMING: I am afraid it might do more damage than good too.

MR. STEIN: That is right, and it would not be easy to achieve, because you would have to get specific authorization of the Congress to do this. This is not the kind of project which is routine.

My recommendation is that if any other device or any other means, including the passage of time, can be worked out on this, that we give that serious consideration.

MR. OEMING: Further, to make specific that recommendation, why isn't it a good idea to have a joint look at this thing next summer with Mr. Mackenthun, if he is going to be assigned here, or whoever you assign?

MR. STEIN: He will be assigned to this.

MR. OEMING: With Mr. Fetterolf.

MR. STEIN: We always keep the home town boys in their area as much as we can, particularly during the summer.

MR. OEMING: Have we resolved any differences here?

MR. STEIN: Yes, I think we have. This is just fine.

MR. OEMING: The only difference I have is in the conclusion of the report.

MR. STEIN: Again, we do not have any firm notions. I think your points are well taken, and this is something which just has to be resolved, and I can see absolutely no reason why there should be any difference between the specialists on this matter.

Mr. Schneider?

MR. SCHNEIDER: Are you going to take up the other question?

MR. STEIN: Yes. That comes next.

The next point we have is this question of considering further treatment or the problem of the four communities.

Did you want to talk about that, Mr. Schneider?

MR. SCHNEIDER: What I meant on the other problem was whether there would be any continuing problem on the discharge of the mining operations drainage.

MR. STEIN: I think that should be covered in the studies. Certainly, I don't see how these fellows can come up with a prognosis without making some kind of analysis of what was coming out from the river.

MR. OEMING: We are back on the iron?

MR. STEIN: On the Iron, what Mr. Schneider points out is that this includes the question of what is happening, that is, whether the discharges from the mines are materially contributing on a continuing basis to the cementing. To my mind I think that this would be natural in this joint study next summer.

I do not see how any conclusion really can be gotten without giving some consideration to that.

MR. OEMING: Well, Mr. Chairman, I think we are getting into detail here. I am perfectly willing and, in fact, I am desirous of getting into detail on this.

I am looking for the Federal biologists and the State biologists to get together on, first of all, what is the effect of cementing of the river insofar as fish and aquatic bottom animals are concerned.

Secondly, is the cementing disappearing naturally? Is there a promise that it will disappear naturally over a period of time, and at approximately what time?

Now, when it comes to the responsibility for cementing, on this we have already indicated or given you results here.

I would propose to you that Mr. Bal, our Regional Engineer, under the operations that control his work, will provide the information on sources of waste, just the same as we do in the Detroit River area. That is, we will make the measurement of flow from the mine waste, of the quantitative analyses made, and provide these to the biologists, and also the river condition as it comes down the Iron.

MR. STEIN: We would agree with that.

MR. OEMING: All right.

MR. STEIN: I don't see that there is any problem there.

The next point I would like to bring up is the four communities, Iron River, Stambaugh, Caspian and Gaastra, and the question of the requirement of additional -- are there any more questions you wanted to raise?

MR. OEMING: No, not at all.

MR. STEIN: All right. The question of whether there is any more treatment required, or if something can be done with adjustments in possibly the operations to bring this down.

MR. PIERCE: Chairman Stein, as indicated in our report, the Department of Health requires all communities to disinfect effluent from waste treatment plants.

This has been accomplished effectively in all except three very small communities, with a total population of 2,500, and these are the ones I believe that you have reference to, these three communities.

Although the effluent provides a very limited amount of exposure to man, and therefore the health hazards are minimal, nevertheless the Health Department had required before the onset of this survey, that these communities provide adequate disinfection facilities.

The communities have accepted this as being desirable, and have employed consulting engineers, assuring that the facilities will be installed by the end of 1964 and, in some cases, before the recreation season commences in 1964.

In the case of Iron River, there is a small area of the community that is not sewered and arrangements have been made for the actual -- let me go back a moment. I stated that there is a small area of the city that is not sewered. This is not correct. This is sewered, and a small sewage treatment plant is provided here, without chlorination, serving 25 homes.

As the report indicates, this condition will be eliminated by the construction of an interceptor sewer next summer, so that this will be treated at the regular plant, at the larger plant.

As to other facilities other than chlorination, in these communities we do not consider them to be inadequate.

However, should they prove to be inadequate, as evidenced by their effects upon the stream, we will require that they be corrected, and we are very certain that this would be accomplished.

MR. STEIN: Thank you, Mr. Pierce.

I think, speaking for myself, this seems to be a thoroughly satisfactory program.

Does Wisconsin have anything to say on this?

MR. WISNIEWSKI: No comment.

MR. STEIN: We have about concluded the summary.

Do any of the conferees feel they want to have anything to add, modify or change?

(No response.)

MR. STEIN: Does anyone in the audience feel we have eliminated something, or done something wrong?

MR. MUEGGE: I would like to confer with Michigan for a moment.

MR. STEIN: All right.

MR. MUEGGE: A brief recess might do it.

MR. STEIN: All right. Let's have a five-minute recess.

(Whereupon a short recess was had.)

MR. STEIN: May we reconvene? Mr. Muegge?

MR. MUEGGE: Mr. Chaima n, we wish to present a statement in two parts. I will give the first part, and

Mr. McDermott will give the second part.

The conferees of the two States agree that the summary of conference discussion should definitely show that both States have pollution control agencies that are cognizant of all sources of pollution of any consequence that exist along the Menominee River and its tributaries in the States of Michigan and Wisconsin.

That these agencies have effective control procedures and have and will continue to use these procedures to bring about improvements in stream conditions, as necessary.

That the programs of these agencies have already brought about improvement in pollution control measures on the part of municipalities and industries, and that continuing programs through outstanding audits or agreements will protect present and future uses of these service waters concerned.

MR. MC DERMOTT: Do you wish me to proceed?

MR. STEIN: Do you want us to take one at a time, or both?

MR. MUEGGE: It can be added as one statement.

MR. MC DERMOTT: It can be added as one statement.

MR. STEIN: I will check with Mr. Schneider. There is no objection to that?

MR. SCHNEIDER: No.

MR. MC DERMOTT: All right. I would like to read this into the record.

The Michigan-Wisconsin conferees acting in concert submit that the following conclusions are warranted:

1. Based on the statements made and information supplied at this conference, it is our belief that there has been no showing made at this conference that pollution of the Menominee River or its tributaries originating in either of the two States here involved is endangering the health or welfare of persons in the other States.

2. Based on such statements and information, such pollution of the Menominee River or its tributaries as presently exists is being adequately dealt with through timely and appropriate measures taken by the water pollution control agencies of Michigan and Wisconsin.

3. Based on such statements and information, it is clear that no undue or unwarranted delay is being encountered by such State agencies in abating such pollution of the Menominee River or its tributaries as presently exist.

Abatement of such pollution cannot be had overnight, but must of necessity involve the passage of sufficient reasonable time to allow municipalities, private corporations, or individuals, to take appropriate action for abatement of any such pollution attributable to them.

That concludes that statement.

MR. STEIN: This will appear in the summary.

However, since this will appear, I don't know that the Federal representatives can agree with that, and I think the Federal position is stated in the summary of their investigative report, which states:

> "Pollution of the Menominee and Brule River is evident. Pollution originating in Michigan and Wisconsin damaged the water quality of the Michigan and Wisconsin waters of these interstate rivers. Pollution, endangering the health and welfare of persons in a state other than in which the pollution originates, is subject to abatement under the Federal Water Pollution Control Act."

Are there any further statements or comments?

(No response.)

MR. STEIN: If not, thank you all for coming, and thank you for persisting and staying with us. This has been very helpful.

We stand adjourned.

(Whereupon, at 12:15 p.m., the conference was adjourned.)